SEPTEMBER, 1955 Vol. 44, No. 7

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

SCHOOL OPENING NUMBER

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Every year thousands of youngsters reach the point in their schooling where each is suddenly faced with the requirement of purchasing a set of drawing instruments. When the boy is the son of a technically trained father or when he asks the advice of a conscientious drafting instructor, the problem of selecting the proper drawing instruments is quickly answered. These men know drawing instruments are normally purchased but once in a lifetime, that the make of instruments selected can be either a matter of many years of rewarding satisfaction or of continual regret.

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They know that the slightly higher cost of world-renowned Dietzgen Drawing Instruments is not only a trifling amount when divided by the years of use but an actual economy when the precision, craftsmanship and higher resale value of genuine Dietzgen Instruments are considered.

They know as well that Dietzgen Drawing Instruments are truly a *lifetime* investment in more ways than one. For these instruments are protected by Dietzgen Lifetime Service Policy. This longstanding policy stipulates that Dietzgen instrument designs are standardized so that lost or damaged parts can be replaced with perfectly fitting parts made from the same tools and with the same skill as the original parts. And this policy stipulates that ***adequate supplies of such parts will be maintained for the entire lifetime of any purchaser of a set of Dietzgen Drawing Instruments.*** How much more imperative then in the face of these true and lasting values that the choice of instruments be without question a Dietzgen set?

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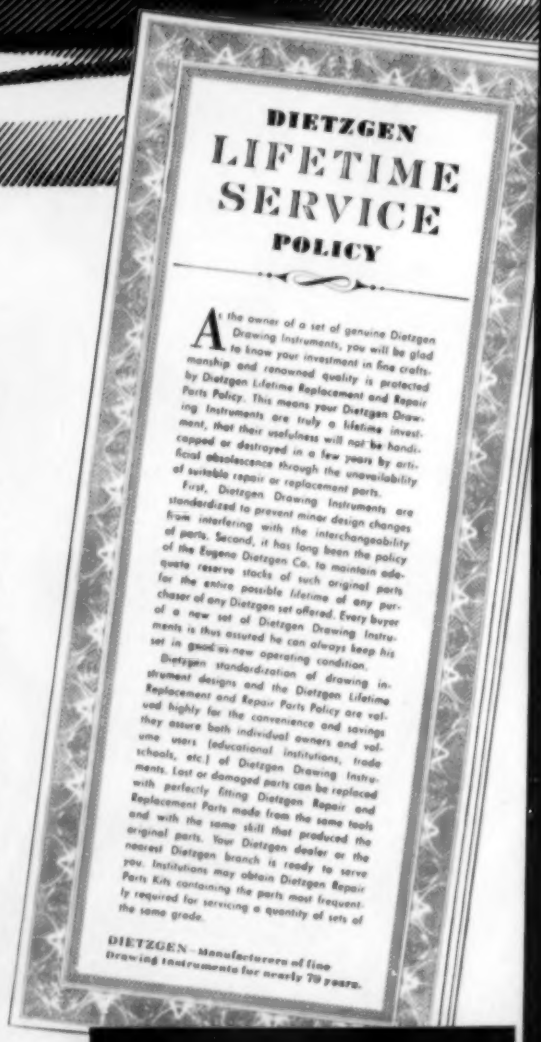
DIETZGEN
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POLICY
As the owner of a set of genuine Dietzgen Drawing Instruments, you will be glad to know your investment in fine craftsmanship and renowned quality is protected by Dietzgen Lifetime Replacement and Repair Parts Policy. This means your Dietzgen Drawing Instruments are truly a lifetime investment, that their usefulness will not be handicapped or destroyed in a few years by artificial obsolescence through the unavailability of suitable repair or replacement parts.
First, Dietzgen Drawing Instruments are standardized to prevent minor design changes from interfering with the interchangeability of parts. Second, it has long been the policy of the Eugene Dietzgen Co. to maintain adequate reserve stocks of such original parts for the entire possible lifetime of any purchaser of any Dietzgen set offered. Every buyer of a new set of Dietzgen Drawing Instruments is thus assured he can always keep his set in good-as-new operating condition.
Dietzgen standardization of drawing instrument designs and the Dietzgen Lifetime Replacement and Repair Parts Policy are valued highly for the convenience and savings they assure both individual owners and volume users (educational institutions, trade schools, etc.) of Dietzgen Drawing Instruments. Lost or damaged parts can be replaced with perfectly fitting Dietzgen Repair and Replacement Parts made from the same tools and with the same skill that produced the original parts. Your Dietzgen dealer or the nearest Dietzgen branch is ready to serve you. Institutions may obtain Dietzgen Repair Parts Kits containing the parts most frequently required for servicing a quantity of sets of the same grade.
DIETZGEN—Manufacturers of fine Drawing Instruments for nearly 70 years.

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EVERYTHING FOR DRAFTING
SURVEYING AND PRINT-MAKING

The busy shop at St. John's is equipped with six big Delta Power Tools.

Parishioners Specify Rockwell-built **DELTA** Power Tools In Shop They Built Themselves

When parishioners of St. John The Baptist Catholic Church in Whiting, Indiana, selected power tools for their woodworking shop, they decided—as have 67% of America's public and parochial schools—on the safety, economy, and ease of operation of Delta Power Tools.

Instructor demonstrates correct use of a Delta 24" Scroll Saw. "The boys are only beginners, but we've had no accidents at all," reports St. John's pastor.

According to Father Lefko, pastor of St. John's when the shop was built, "We've found Delta Tools to be very safe and efficient. They make possible a complete range of projects, and maintenance is negligible."

This shop is unique not only because of its completeness and efficiency, but because the parishioners *built it themselves* on donated time. It was built to combine wholesome fun with first class industrial arts instruction. The students are first trained on hand tools; the opportunity to work on the Delta tools forming a kind of reward for increased ability. Originally intended for school-age boys, the shop so interested the boys' fathers that one extra evening a week had to be reserved for them!

And, as an added bonus, the Delta-equipped shop now provides the church with complete maintenance and repair facilities.

Delta Power Tools are not only safe, versatile and economical. But because they are the same tools used in industry, they also provide practical "on-the-job" training. Investigate the advantages of low-cost Delta Power Tools for your industrial arts program. Your Delta Dealer will be glad to arrange a demonstration. He's listed in the Classified Pages under "TOOLS" or "MACHINERY."

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DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

ROCKWELL

Delta Power Tool Division
Rockwell Manufacturing Company
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☐ Please send name of my nearest Delta Dealer.

☐ Please send Delta AB-54 catalog.

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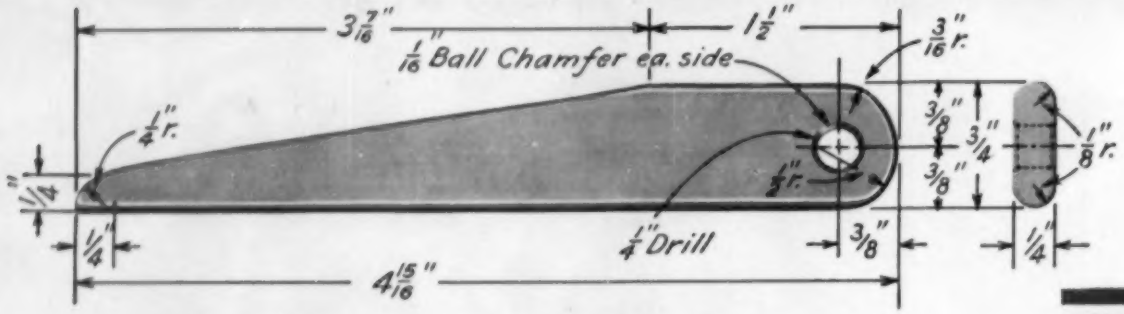
HOW-TO project for the School Shop

—by NICHOLSON FILE COMPANY

NO. 10 OF A SERIES



MAKING A DRILL DRIFT

In this exercise, the school shop student gains some familiarity with laying out work, and with basic hand and power tools. He also learns about the ability of Nicholson Rotary and Hand files to remove metal rapidly yet give a smooth, precise finish.

Material: 1 piece 1/4" x 3/4" x 5" CRS.

Tools: Copper vise jaws, layout dope, 6" rule, scriber, 3" dividers, center punch, hammer, 1/4" drill, C7M or C7F Nicholson Ball Rotary file, square, hacksaw, surface gage, Nicholson 8" Mill and 10" Flat Bastard files.

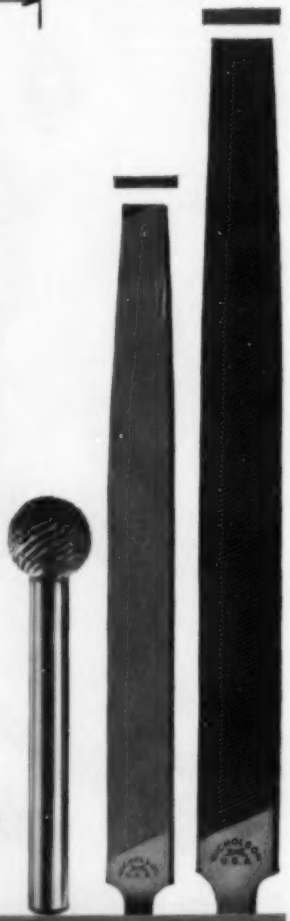
SCHEDULE OF OPERATIONS

1. File all burs from stock, and file one end square to insure accuracy of succeeding measurements, using Nicholson 10" Flat Bastard file. **2.** Paint work with layout dope. **3.** With 6" rule, square and scriber, scribe line perpendicular to base and 1/4" from squared end of work. **4.** Set dividers to 1/4". With one leg of dividers at extreme corner of work, scribe arc to meet perpendicular line. **5.** Mark point 3 7/16" from end of work. From this point scribe line tangential to

1/4" radius, using 6" rule and scriber. **6.** At opposite end of work, scribe horizontal center line about 1" long, using surface gage set to 3/8". **7.** Measure 4 9/16" from square-filed end and scribe perpendicular center line to intersect horizontal center line. Lightly center punch at the intersection. **8.** Set dividers to 3/8". Scribe

radius from center punch at end of work. **9.** Enlarge center punch mark to insure drill centering itself. Drill 1/4" hole. **10.** Remove burs from both sides of hole to 5/16" dia. with Nicholson C7M 1/2" Ball Rotary file, using drill press @ 3000 rpm. If necessary to use a slower speed, the Nicholson C7F Ball Rotary file should be employed. The student is cau-

tioned to observe all safety measures. **11.** Set surface gage to 1/8" and scribe reference lines for filing radii on edges of work. **12.** Hold work perpendicular in vise between copper vise jaws. Saw approximately 1/32" from line. (Note: use hacksaw with about 18 teeth to the inch, and not more than 50 strokes per minute.) **13.** Rough file all surfaces with Nicholson 10" Flat Bastard file. **14.** Draw file all surfaces with Nicholson 8" Mill file. Use chalk for a smooth, clean finish. Check work with instructor, and case harden.



The Nicholson C7 Ball Rotary file is shown full size. The Nicholson 8" Mill and 10" Flat Bastard files are shown approximately half size. Widely available (also in Black Diamond brand) through industrial supply houses and hardware dealers.

FREE REPRINTS OF THIS PAGE

for school-shop use will be sent to school heads or instructors on individual request. Please ask for "How-To Project No. 10," stating minimum number of copies required.

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SEPTEMBER
1955

VOL. 44 NO. 7

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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This Month's Cover

Mr. Willard Allen, instructor in the department of industrial arts, Ball State Teachers College, Muncie, Ind., is shown giving instructions to a student on simulated flying problems by the use of a Link trainer.

Photography by Bernard R. Josif and Bruce Leeka.

★ ★ ★ ★

Your New Address

Please be sure to notify our circulation department of any change of address you have made, so you will not lose any of the issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine for the coming year.

★ ★ ★ ★

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Association News

COMING CONVENTIONS

Oct. 7–8. Ohio Vocational Association, at Southern Hotel, Columbus, Ohio. Secretary, Ralph J. Woodin, Ohio State University, Columbus, Ohio.

Oct. 27–28. Minnesota Vocational Association, at Minneapolis, Minn. Secretary, Clifford Horn, High School, St. Louis Park, Minn.

EPSILON PI TAU CHAPTER INSTALLED AT LONG BEACH STATE COLLEGE

On May 28 the Alpha Phi Chapter of Epsilon Pi Tau was installed at the Long Beach State College. Fifty initiates were initiated into the fraternity at a very impressive installation ceremony.

The University of California at Santa Barbara provided the initiating team and installed the Chapter. The initiation was held in the Little Theatre on the new college campus. The ceremony was attended by the entire college administration and many distinguished guests from all parts of California.

The initiation was followed by an installation banquet at the Lafayette Hotel. Robert Woodward, state consultant in industrial arts was master of ceremony for the occasion. The roll call of Chapters was made by Dr. Lynne Monroe, professor of industrial arts at Santa Barbara. The Chapter Charter was received by Dr. David Bryant, executive dean at Long Beach State College and a cordial welcome was made by Dr. P. Victor Peterson, college president.

See picture on page 208.

The main address "Scientific Progress — It's Challenge to You" was delivered by Ray O. Mertes, Director of School and Colleges, United Airlines. This was a very inspiring and challenging talk and was enjoyed by all those in attendance.

Chapter officers are: Harold Lange, president; James Gaddis, vice-president; Roy Takeshita, secretary; Roy Sulack, treasurer; Dr. C. Thomas Dean, trustee; and Floyd Grainge, cotrustee.

A laureate citation was bestowed upon Ray O. Mertes for his leadership in the field of aviation education. — *Dr. C. Thomas Dean.*

INSTALLATION OF E.P.T. ALPHA PSI CHAPTER

The industrial-arts department of Los Angeles State College, Los Angeles, Calif., climaxed its second year with the installation of the Alpha Psi Chapter of Epsilon Pi Tau, May 27, 1955.

Dr. William E. Warner, national executive secretary of Epsilon Pi Tau, acting as trustee, gave an informative presentation telling of the growth and influence of the fraternity.

See picture on page 210.

The initiates were: Richard E. Bowe, Philip J. Breskin, Bruce C. Carnachan, Glenwood G. Cummings, Clarence I. Ferm, Leonard A. Filloon, Elvin W. Hurst, John LaMonica, Kenneth C. Larson, Philip C. Lewis, Paul S. Light, Fred L. Mortensen, Ernest W. Navrides, Joseph E. Niven, Peter Petris, John C. Switzer, Homer D. Fetty, co-ordinator of business and industrial education; Richard J. Hoffman, chairman of Journalism and Graphic Arts Department Los Angeles City College; Willis M. Kenealy, dean of Applied Arts and Sciences; and Hudson Roysher, associate professor of Art.

J. Lyman Goldsmith, head supervisor of Vocational and Practical Arts, Los Angeles City Schools, acted as toastmaster at the installation banquet which followed the initiation.

Dr. Willis M. Kenealy welcomed Epsilon Pi Tau members from various field and campus chapters and other distinguished guests.

These distinguished guests included: Fred Baer, supervisor, Industrial Arts, Junior High School Division, Los Angeles City Schools; Hartwig O. Bjerg, assistant professor of Industrial Arts, Arizona State College; Dr. Tom Dean, chairman, Industrial Arts Department, Long Beach State College; Clifford Dobson, supervisor, Industrial Education, Burbank Unified School District; Gordon Funk, supervisor, Senior High School Industrial Education, Los Angeles City Schools; Howard E. Marvin, director of Vocational Education, Pasadena City Schools; Professor Lynn C. Monroe, Santa Barbara College; Dr. Kenneth Philips, chairman, Industrial Arts Department, San Diego State College; Lee W. Ralston, director, Division of Trade and Industrial Education, Los Angeles County Schools; David O. Taxis, consultant, Industrial Arts Education, Los Angeles County; Wayne A. Wonacott, Industrial Arts Supervisor, Los

(Continued on page 8A)

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It's not just chance that Millers Falls bit braces rank as the world's largest-selling quality line.

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You'll find these smooth-acting, accurate tools help bring out the best work your students can do. And you'll find, too, that Millers Falls rugged braces are great budget-stretchers — long wearing tools that stand up under tough school shop use and last for years.

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49
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"HOW TO RUN A DRILL PRESS"

A practical 32-page handbook on the use and operation of the sensitive drill press. Considerable material on specialized operations. 25c per copy.

"HOW TO RUN A SHAPER"

The operation of the metalworking bench shaper is clearly explained in this 32-page handbook. Many practical job set-ups shown. 25c per copy.

"THE METAL WORKING LATHE"

Film No. I Introduces the student to the standard back-geared, screw-cutting lathe by familiarizing him with principal lathe parts, their names, purpose and operation. Showing time, 20 min. 16 mm sound in full color. *Free loan.*

"PLAIN TURNING"

Film No. II Teaches all basic operations in between centers machining. Shows use of calipers and micrometers, drilling center holes, selecting cutter bits, facing, rough and finish turning. Time, 20 min. 16 mm sound, full color. *Free loan.*

"GRINDING and USE of BASIC LATHE TOOL CUTTER BITS"

Film No. III Shows grinding of cutter bits for rough and finish turning, cutting off, thread cutting. Also, tool adjustment and action. Time, 20 minutes. 16 mm sound, full color. *Free loan.*

All South Bend motion pictures available with sound track in English, Spanish, or French.

FOUR "WALL CHARTS"

"Principal Parts of a Lathe," "How to Become a Machinist," "Decimal Equivalents," "Tap Drill Sizes" — 15c each.

SHOP PLAN MODEL KIT

Take the guesswork out of planning the school shop. Write for Bulletin 5301 which shows how South Bend's ¾" scale model kit allows 3-D's to save time and cost.

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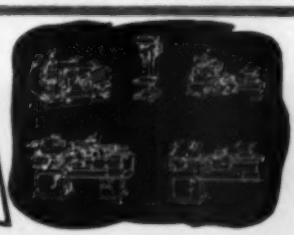

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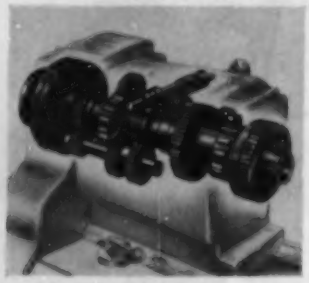
CLAUSING LATHES

YOUR CHECK LIST OF LATHE VALUE

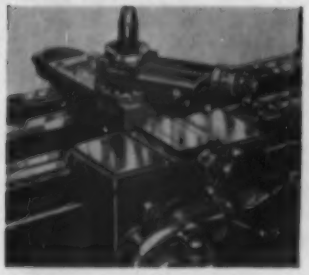
☑ Is headstock fully enclosed with gears traveling in oil bath?



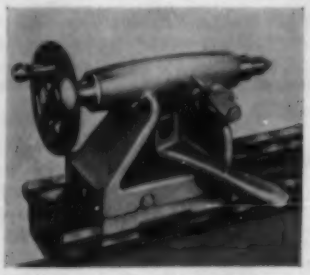
☑ Does spindle turn on widely spaced "Zero-Precision" Timken tapered roller bearings?

☑ Does it have fully enclosed dual-belt outboard drive with quick, easy belt replacement?

☑ Is Quick-Change box fully enclosed with gears and shafts running in bath of oil?



☑ Is automatic apron fully enclosed with entire mechanism running in sealed oil bath?



☑ Does tailstock have No. 3 M.T. ram with tang socket and permanently attached swing type wrench?

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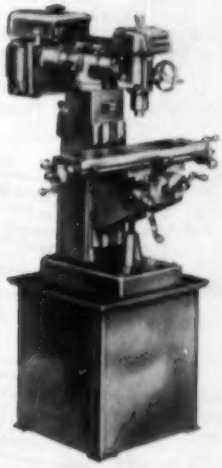

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ASSOCIATION NEWS

(Continued from page 4A)

Angeles Elementary Schools; and Robert L. Woodward, consultant in Industrial Arts Education, California State Department of Education.

Dr. William E. Warner extended greetings from National Headquarters, and presented the charter to Claude E. Nihart, trustee of the new Alpha Psi Chapter.

Mr. Nihart, assisted by Alvin R. Lappin, co-trustee, installed the officers of the new chapter in a colorful ceremony.

The officers are: John C. Switzer, president; Leonard A. Filloon, vice-president; Peter Petris, secretary; and Philip E. Lewis, treasurer.

The major address, "What Is Recognition?" presented by Dr. Howard A. Campion, associate superintendent, Los Angeles City Schools.

THETA CHAPTER, E.P.T. INITIATES

Theta Chapter of Epsilon Pi Tau at Stout State College, Menomonie, Wis., has added 17 new members to its number, following the oral examination held on March 14. The formal initiation and banquet was held March 26, 1955.

The new members are as follows: Clinton Byrnes, George Rogers Clark, Robert Duren, Maurice Ellis, Donald Hagen, Dick Klatt, Joseph Koch, Joel Lamke, Henry Moerschel, Robert Olstrom, Donald Pritchard, James Rawson, Joel Russell, Marlon Scharf, Edwin Siefert, Stanley Suk, and Theodore E. Wiehe.

The initiation team consisted of Robert Erickson, Philip Ruehl, Jerome Abbot, Edward Treise, Robert Swanson, Glen Matl, Orville Nelson, and John A. Jarvis performed the ceremony of the formal initiation.

Following the ceremony, a banquet was held at the Hotel Marion. Robert Erickson, president of Theta Chapter, acted as toastmaster, and John A. Jarvis gave the welcome address to the new members. George Rogers Clark responded on behalf of the new members. Dr. Ralph G. Iverson, professor of education and director of student personnel services, delivered the main address. Dr. Iverson, in his topic, "The Need for a Great Profession," emphasized the role of the teacher in preserving our great civilization.

AMERICAN INDUSTRIAL ARTS ASSOCIATION

The American Industrial Arts Association held a one-day program at the Conrad Hilton Hotel in Chicago, on July 4, 1955, in connection with the N.E.A. summer meeting.

A section meeting was conducted at 10:00 a.m., in the dining room of the hotel, and the chairman of that session was W. P. Klingensmith, supervisor, division of industrial arts, Chicago public schools. This meeting covered "Industrial Arts in Action."

A craft demonstration was held on "Working with Leather," under Raymond B. Grashoff, supervisor, division of industrial arts, Chicago public schools; and one on "Adventures with Plastics" guided by Coleman Hewitt, head, industrial-arts department, Chicago Teachers College.

Following the noon-day luncheon, introductions were given by Professor Milo T. Oakland, head, industrial-arts department, Northern Illinois State Teachers College, DeKalb, Ill.

A discourse on "Industrial Arts in Modern Education" followed by Burl N. Osburn, president, American Industrial Arts Association, and head of industrial arts department, State Teachers College, Millersville, Pa.

In the afternoon a panel presentation under Chairman M. Ray Karnes, was conducted. He was assisted by Amos Coleman, Corwin A. Hellmer, Milo T. Oakland, Harry A. Pederson, Harold L. Richards, Paul L. Roise, and John A. Whitesel. The subject was "The Function and Character of Industrial Arts in the Elementary and Secondary School."

PRESIDENT OF THE M.I.E.S.

Harold Hill, teacher of graphic arts at the Durfee Intermediate School in Detroit, was elected president of the Michigan Industrial Education Society at their spring convention in Grand Rapids.

Mr. Hill is a graduate of Michigan State

(Continued on page 49A)

Harold S. Hill

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CHICAGO U.S.A.

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Sheldon lathes are modern in design. With their easy-to-operate controls, students can learn basic lathe operations quickly and rapidly advance to practical shop projects.

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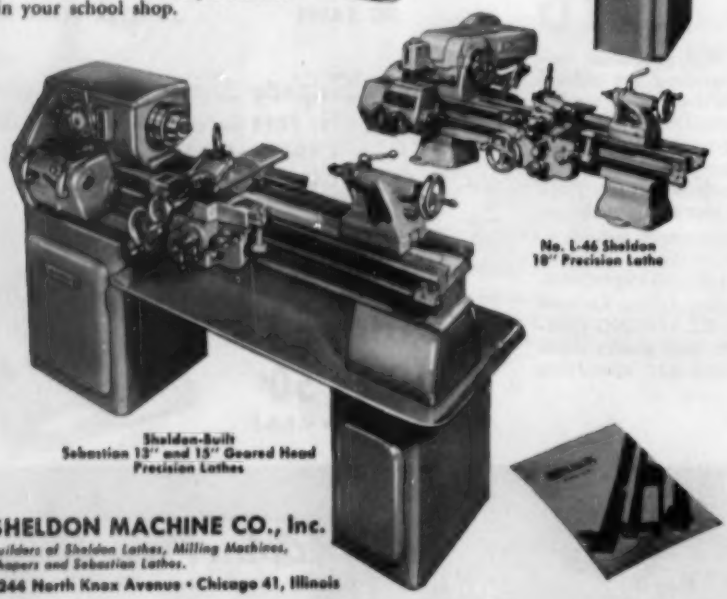

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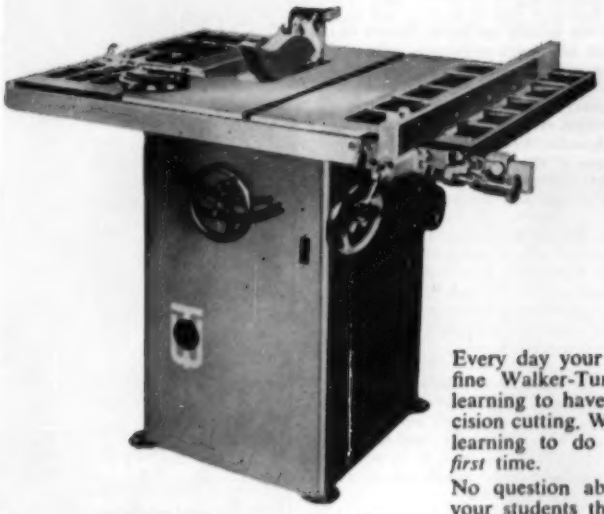

No. 2221 — 10" Tilting Arbor Saw — Capacity: 3⅛" with 10" blade; 2⅛" at 45°; with 6" dado, 1⅛". Speed: 3800 rpm. Table: 32½" deep x 32" wide; 32½" x 45¾" with extension. With 10" combination blade, extension tables, miter gauge, guard, splitter, motor pulley and belt (without motor) $297.00.

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No question about it — to give your students the skills and confidence you want them to take out into the workaday world, you have to teach with the machine tools they'll find when they go to work on a job. They'll find plenty of Walker-Turners — you can be sure of that.

See that your students have the advantage of experience with all of the outstanding features of these new Walker-Turner Light-Heavyweight Saws. Motor mounting and arbor *tilt as a unit*. Guard and splitter are always lined up with the blade for protection at any angle. Arbors on all models are mounted on precision ball bearings.

These rugged, new Walker-Turners give you performance and accuracy you'd normally find only in much heavier, more expensive machines.

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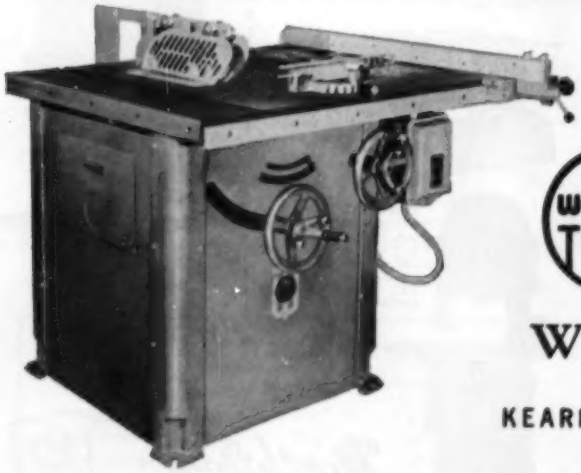

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Your Students Will Learn FASTER on a PARKS PLANER

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20" PLANER

Students advance quickly on Parks Planers because they find them easy to operate, safe, and accurate. And, since both the Parks 12" and Parks 20" Planers have been designed and precision-built for accuracy and high-speed line production in industry, they are ideally suited for the school shop because they give practical experience on the type of machines your students will eventually use. Both machines are priced low enough for even the most modest shop budget.

The Parks No. 20. 20" Planer has a 4-knife cutterhead with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M., and 40 and 80 F. P. M. Will take work up to 20" wide by 6" thick. Ruggedly built for vibrationless operation.

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12" x 4" PLANER

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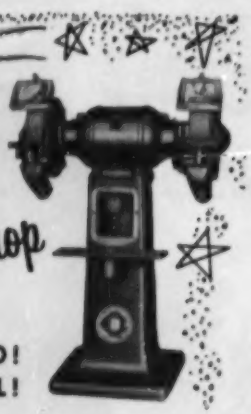
Perfect for the school shop



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A Queen City pedestal or bench Grinder is a wise choice for the school shop. It has the features and performance of industrial grinders: repulsion-induction motor, fully enclosed; rugged bearings and guards; high quality switches and cords . . . yet the price is 20 to 30% less!

Queen City's new ¾ H.P. Bench or Pedestal combination Grinder and Buffer fits all school shop requirements perfectly. Find out why Queen City Grinders have been used in vocational training for over 30 years. Available from ⅓ H.P. on up.

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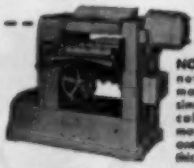
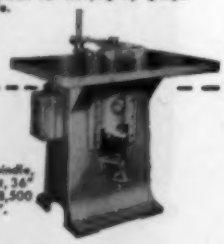
HAND JOINTER—compact and accessible. Built in 8" and 12" width. Table 6'2" long, maximum rabbet depth 9/16". Round, 3 knife safety type cylinder head, 3 HP 3600 RPM motor.



NO. 2 SURFACER—new, streamlined machine. Features simplified, mechanical design. Takes material 18" wide and from ⅛" to 8" thick.

NO. 4 VARIETY SAW—for variety sawing in any shop! Standard table 44" long and 36" wide, plus 19½" extension for carrying rip gauge table.

BAND SAWS — machine 20" diameter wheel illustrated. Floor space 24" x 36", horizontal capacity 20", vertical capacity under guide 11". Also 27" 32", and 36" machines available.



SHAPER—1" diameter spindle, with 4½" vertical adjustment, 36" x 26" table, spindle speed—8,500 RPM, floor space—34"x37".

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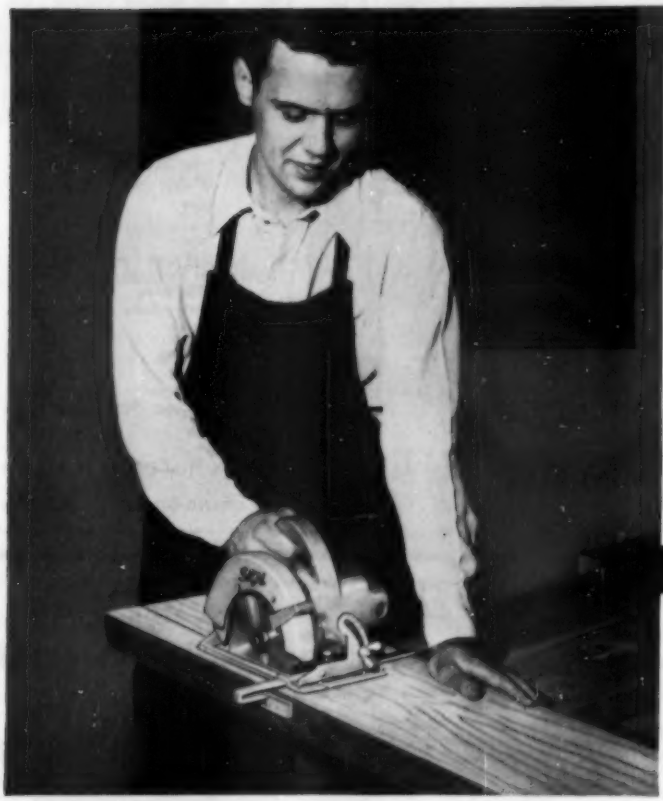
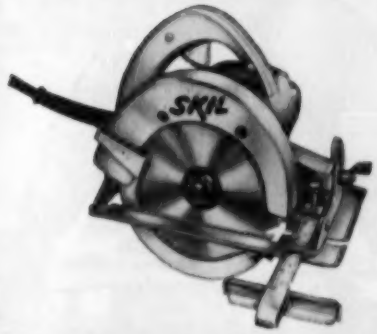
Catalog

Train Him to Use the Saws That Are the Standard of Carpenters

GENUINE SKIL SAWS





New 6½" Model 864 (above) only $64.50
Model 874 7¼" only $74.50
Model 884 8½" only $84.50

These new, powerful, heavy-duty SKIL Saws are standard throughout the building trades. These are the tools your students will use to earn their living. Put one in the hands of any young man and watch his enthusiasm grow by the minute.

Designed for performance and built to "take it" under every condition. Your students will be able to undertake bigger, more ambitious shop projects. They'll learn more.

LOOK AT THESE FEATURES:

- **Light weight; famous SKIL balanced design for easy handling.**
- **Easy, fast cutting in any position.**
- **High blade speed.**
- **Rugged, heavy-duty motor.**
- **Strong die-cast aluminum motor housing.**
- **Ball and needle roller bearings throughout.**
- **Quick-acting depth and bevel adjustment.**
- **Calibrated rip fence for accurate ripping.**
- **Safety guard retracting handle for pocket cuts and abrasive disc use.**

BRIEF SPECIFICATIONS

Model No.	864	874	884
Blade Diameters	6½"	7¼"	8¼"
Maximum Depth of Cut	2⅛"	2⅜"	2⅝"
Depth Cut at 45°	1¾"	1⅞"	2⅛"
No-Load Speed	6100 r.p.m.	6000 r.p.m.	5700 r.p.m.
Net Weight	10¾ lbs.	13½ lbs.	14½ lbs.

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Use Snap-on* TORQOMETERS

...to teach the importance of precision tensioning!

Working with a Snap-on Torqometer, a student quickly grasps the importance of precision tensioning *wherever bolt pressure is specified.* It's easy to show him that, using a standard wrench, it is impossible to even approximate a specified pressure. On a Torqometer's big, easy-to-read dial he *sees* the accuracy of his work—*sees* the needle strike the exact inch-or-foot-pound. He learns that he not only does the job *right,* but does it with greater speed and ease. For full information on Torqometers write for the complete 104-page Snap-on Catalog—sent free to school officials and shop instructors.

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"OLIVER" 18-in. Planer is unmatched for surfacing small stock

This sturdy "Oliver" Surfacer has one-piece base that assures permanent alignment of parts. Heavy ball bearing cylinder has three high-speed knives. Power driven feed rolls — 15' to 35' a minute. Takes stock up to 18" wide, 6" thick, as short as 8½" when fed singly. Turns out exceptionally accurate and smooth work. Write for Bulletin No. 399.

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...vises for every need and purpose!

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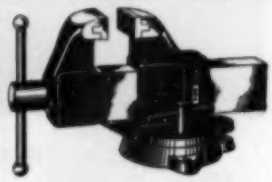
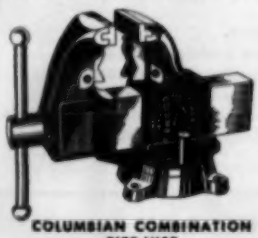


COLUMBIAN MACHINISTS' VISE



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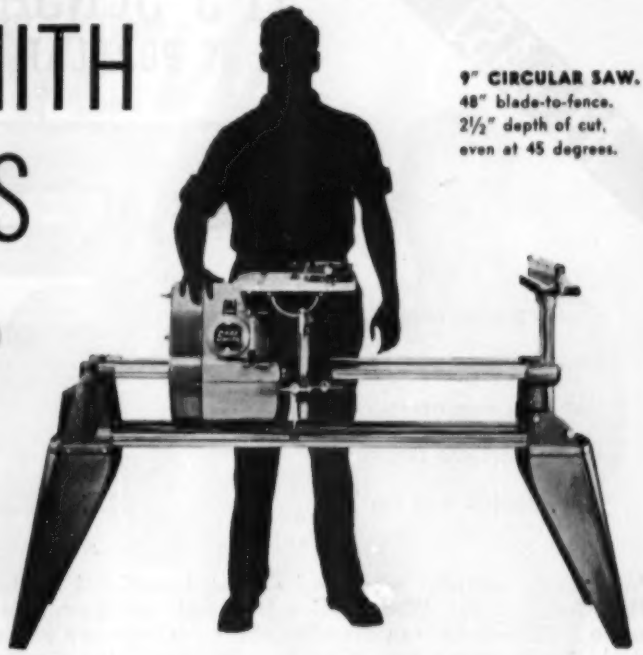
How 1 SHOPSMITH can add 7 TOOLS to your school shop

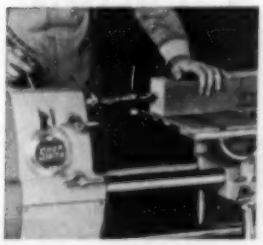
SHOPSMITH can break 7 bottlenecks in 7 minutes—use it as the tool that's needed most



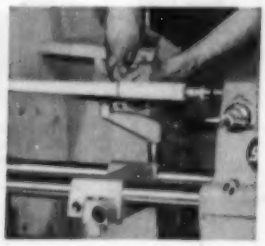
9" CIRCULAR SAW. 48" blade-to-fence. 2½" depth of cut, even at 45 degrees.

12" Disc Sander. Depth control dial for feeding disc into work. Built-in jigs. Quick-change discs.

16½" Vertical Drill Press. 58" chuck-to-floor. 26" chuck-to-table. All ball-bearing spindle.



Horizontal Drill bores accurately in edges or ends of big material. Table adjusts to hairline settings.



Lathe with 16½" swing. 34" between centers. Variable speed control with exclusive Speed-Dial.

4" Jointer with 28" table, ⅛" depth of cut, can be added to Power-Mount in just 15 seconds.

15" Jigsaw with variable speeds added to Power-Mount. Can work in combination with drum sander.

Does traffic pile up at your circular saw? SHOPSMITH® can be a saw. A bottleneck at the sander? Change your SHOPSMITH to a disc sander. Need an extra drill in a hurry? You can change your SHOPSMITH to a horizontal or vertical drill in less than a minute. Log jam at the lathe? Use your SHOPSMITH as a lathe.

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SHOPSMITH operates easily and safely, too. You can dial exact speeds required for any job with the Speed-Dial. The ¾-hp. motor and all pulleys are fully enclosed. There's a guarded switch, a special saw guard available.

This space-saving, fast-converting, flexible work station can start breaking bottlenecks in your shop the first day it's installed. Why put up with delays another season? SHOPSMITH can be delivered for only $289.50.

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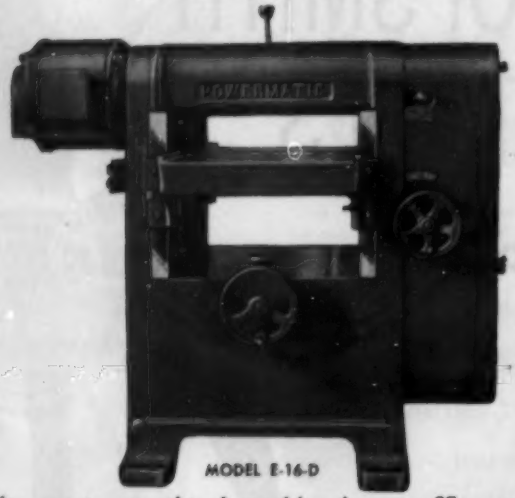

MODEL E-16-D

DIRECT DRIVE MOTOR

CUTTERHEAD SPEED 3600 R.P.M.

4" DIAMETER CUTTERHEAD

SEALED CUTTERHEAD BEARINGS

FEED RATE 15 to 37 FPM

ALL CAST IRON CONSTRUCTION

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DYNAMICALLY BALANCED CUTTERHEAD

POWER DRIVEN FEED ROLLS

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Powermatic proudly presents its most sensational machine in over 25 years of manufacturing experience. The Model E-16D, Direct Drive 16" single surfacer, was created by popular demand and this twin sister to the E-16 Belt Driven machine offers performance plus; the cabinet makers' dream, the production plants' ideal. If you desire year after year of troublefree service by all means check the performance and quality of this machine before you make *any* decision. Write for complete information.

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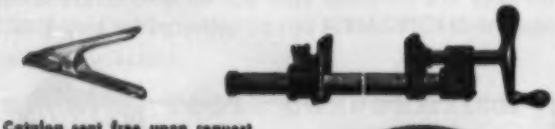

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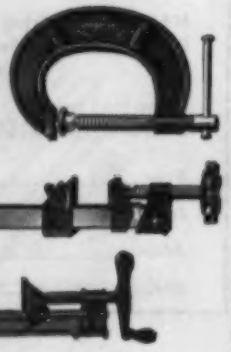

NEW PORTABLE ELECTRIC JIG SAW DOES WORK OF 7 DIFFERENT SAWS

Cuts Wood, Plastics, Metals, Composition Materials, etc.

DALTON

MODEL D-500

Portable ★ Electric

JIG SAW

PISTOL GRIP HANDLE obsoletes the old, uncomfortable method of running such a tool by gripping it around the motor housing. Provides COOLER handling . . . GREATER sawing accuracy through easier operation and control.

The Dalton D-500 performs a multitude of cutting jobs quickly, easily, accurately. Stretches school budgets because it saves on investing in single purpose machines. Besides the PISTOL GRIP HANDLE, it features: A special motor, Oilite bearings, hardened steel gears; makes own starting hole for inside cuts; air stream blows sawdust off guide line. Complete with 5 different blades. It saws circles, straight lines, intricate designs.

7 SAWS IN ONE

• Rip Saw • Coping Saw • Crosscut Saw • Jig Saw • Scroll Saw • Band Saw • Keyhole Saw

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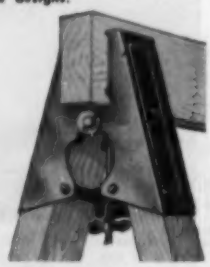
SAWHORSE BRACKETS

Fully Mechanimal — Require No Nails, Bolts or Miter Cuts on Legs
Sizes for 1x4's and 2x4's

Simply put lumber in jaws and leg sockets — tighten wingnut! All steel. Use for upholstery classes, display stands, material racks, blue print tables, platforms, etc. Disassemble for storage.

If not stocked by your hardware supplier, have him order for you.



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DALTON MFG. CO., 20 S. Central, St. Louis 5, Mo.

How the NEW

Cincinnati No. 1 Cutter and Tool Grinder

FITS INTO YOUR SCHOOL SHOP PROGRAM

It takes a lot of know-how to correctly sharpen a cutter; know-how which your boys will retain and understand quicker when they can work on a new CINCINNATI No. 1 Cutter and Tool Grinder. These machines are designed for industry, but priced within the vocational budget. They incorporate many unique features of value in the school shop as well as manufacturing shop. Three features of interest to teachers are illustrated here. Other facts which you will want to know about: small space requirements, only 45" x 39½" maximum . . . built-in wheelhead motor with belt fully guarded . . . duplicate controls for right- and left-hand operation . . . versatility for other grinding operations in addition to cutter sharpening. The complete story of new CINCINNATI No. 1 Cutter and Tool Grinders will be found in catalog No. M-1852. May we send a copy to you?

THE CINCINNATI MILLING MACHINE CO.
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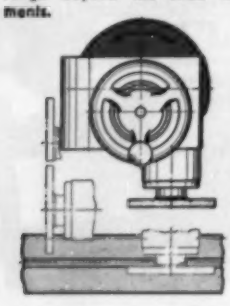
Sharpening a spiral end mill. The student will quickly learn how to correctly and accurately sharpen all types of cutters on the new CINCINNATI No. 1 Cutter and Tool Grinder.

An innovation in versatility . . . the grinding wheelhead is eccentrically mounted on its swivel base, extending the machine range beyond the slide movements.



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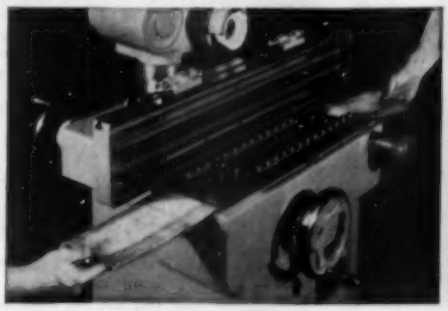

The elevating handwheel is accessible from all operating positions.

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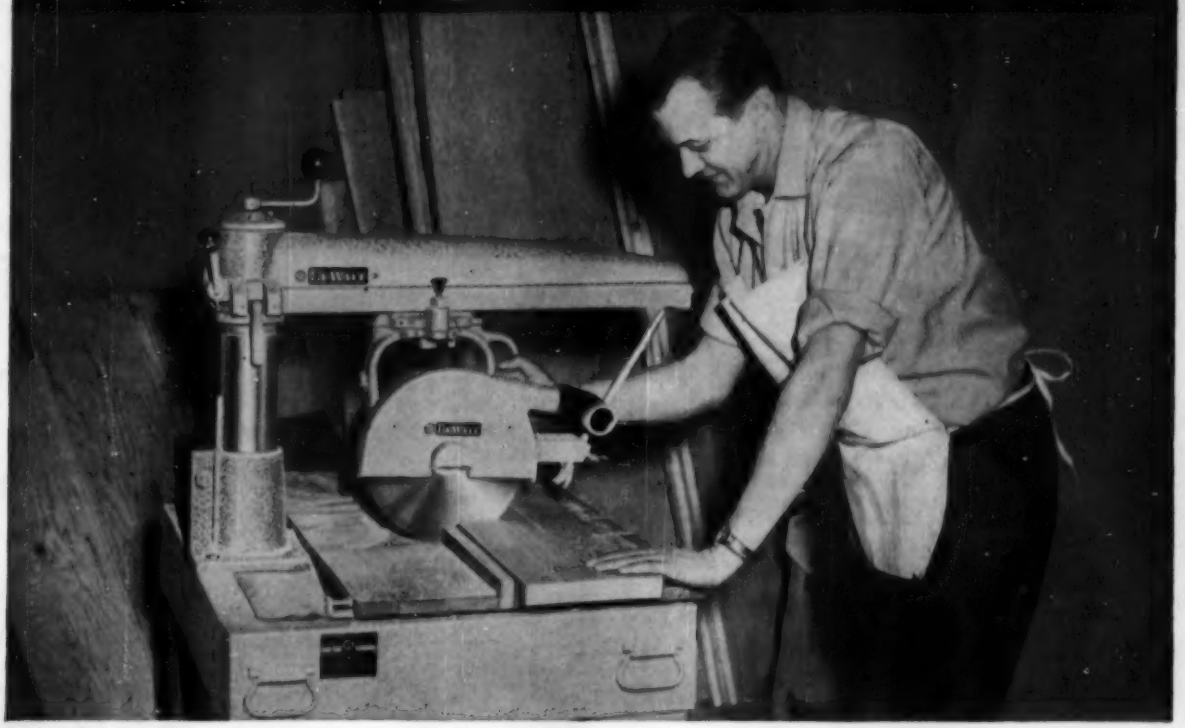

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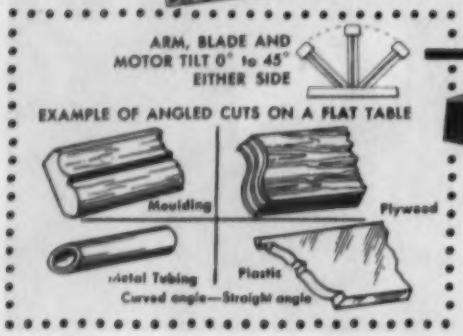

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Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
SEPTEMBER 1955

Scrutinize the Course of Study Before —

Integrating Electricity With Vocational Agriculture

OVERTON R. JOHNSON
Professor, Agricultural Education
Virginia State College
Petersburg, Va.

Since electricity may now be utilized in the production and management of all farm enterprises, rural electrification should be integrated with *all* units of instruction in vocational agriculture. Integration seems to offer three distinct advantages: It correlates instruction; it offers informational material in phases of farm mechanics that would otherwise be omitted; and conserves the instructor's as well as the students' time.

Since man is a being that takes a long time to prepare for a short period of time in his life, then, with reference to vocational agriculture, integration, technically and academically, is possibly the only solution to a compromise between the element of time and the amount of information to be formally taught.

Areas of Integration

The following abbreviated integrational unit outline relative to poultry enterprises is offered as a guide in selecting activities to be incorporated in the course of study.

Poultry Enterprise

I. Producing Chicks
  A. Incubating
    1. Incubator
      20 to 30 more chicks per 100 eggs. Available in many sizes.
  B. Brooding
    1. Brooder
      Free from fire hazard — doesn't consume oxygen or give off toxic fumes. Better growth and quicker feathering results from accurate control.
    2. Ultra-violet light
      Promotes health and growth.
    3. Debeaker
      Quicker and more efficient operation.
  C. Marketing
    1. Caponizer
      Increases number of birds processed per hour.
    2. Scalder
      Heating element in tank provides correct temperature to loosen feathers but does not damage skin.
    3. Waxer
      Keeps wax at right temperature — wax when removed, holds pin feathers and hairs.
    4. Picker
      Feathers removed faster and better by rubber fingers on a revolving cylinder.

II. Producing Eggs
  A. Housing
    1. House Ventilator
      Electric fan reduces dampness, increases health and comfort; thus steps up production.
    2. Artificial Light
      Steps up production at the right time to get highest prices. May be automatically controlled.
  B. Feeding
    1. Feeders
      Replenishes mash ration periodically and automatically.
    2. Water Warmer
      Keeps water from freezing — encourages drinking, thus helping production.
    3. Linear Heater
      Assures automatic water supply for poultry even during cold winter months.
  C. Marketing
    1. Egg Cleaner
      Buffer driven motor, speeds egg cleaning.
    2. Egg Candler
      Light makes possible the removal of low-quality and cracked eggs.
    3. Egg Grader
      Eggs graded by weight bring higher prices. Automatically operated, saves hours.

4. Egg Cooler
   Quality improved by cooling eggs immediately after gathering.
5. Egg Washer
   Less breakage than when cleaned by hand.
6. Egg Conveyor and Hoist
   Eliminates time consuming chores, especially in more than one story buildings.

Method of Integration

One of the basic factors to possible successful integration is a comprehensive course of study. Whether or not integration of electricity may be applied is determined by the choice of basic teaching units within the course of study.

The course of study should be thoroughly scrutinized and revised to include those units of instruction which are based on needs of the students, abilities, local conditions, time, etc. After this is done, then the instructor is ready to choose those activities within the course of study which offer an integrational opportunity. This should be done for each enterprise using the areas of integration such as that outlined previously for poultry. These areas may or may not be common to each teacher's locality.

Attention is called to the fact that these now newly revised lesson plans and the course of study are not for offering instruction in electricity *only* and predominately, but to offer it in conjunction with other instructional activities.

The choice of a particular job or jobs from the course of study in which integration is planned involves the task of lesson plan revision to include all integrational information on electricity relative to the unit which the instructor and students deem important.

In many instances the integrational information relative to a particular job may be only a short activity, informal study, or discussion. An example: The job of grading eggs in the poultry enterprise will include an activity of egg candling. This activity may be in the form of a demonstration showing the advantages of the candler in detecting low-quality and cracked eggs. A few minutes may be used to allow each student to participate in candling eggs with a discussion of such factors as cost of egg candlers, advantages, etc., following. If more detail work is desired by the pupils and egg production within the community warrants more attention to this problem, a farm shop activity dealing with egg candler construction may be scheduled.

In connection with the problem of teaching rural electrification to high school students, it is a good idea to make sure that the students understand something of the basic principles before they attempt to use electricity extensively. With the study of electricity on the farm as motivation for understanding these principles, the instructor should find it much easier to do a good job of teaching than when the subject matter is being taught as a series of ordinary exercises. For example, the principles involved in transformers should be much more interesting than usual when taught in connection with an actual transformer installation. Here there is an opportunity to show how the voltage of from 2300 to 11,000 volts of the primary line is reduced to 110 or 220 volts for use about the farm.

Inasmuch as teachers are charged with the responsibility of teaching the "whole child," they should investigate the probabilities of correlating instruction in electricity with instruction offered by the mathematics, physics, and science instructors. This is an approach that should not be regarded lightly. There are many phases of electricity which are peculiarly adaptable to the fields of physics, mathematics, and science. Probably it may even be said that better results may be obtained in these fields with phases of electricity than could be obtained in vocational agriculture. The physics and science instructors are well qualified and could easily offer instruction in the basic fundamentals of electricity. So could the mathematics instructor design mathematical activities relative to such things as electrical cost computations, meter reading, horsepower, pulleys, etc. No doubt such instruction is normally offered in many high schools. However, it is questionable whether such instruction is correlated with agriculture.

Every teacher should give due consideration to his own limitations in ability and training and thus plan to utilize electrical specialists whenever and wherever needed. The fact that one cannot be well trained in all things is generally accepted and thus responsibility for the education of youngsters is not wholly the school's or that of any one instructor within the school.

Time requirements for integration may alter the course offering depending upon the extent of integrational instruction and activity determined important. However, total time allotment should not necessarily change but merely a shifting of time requirements for units within enterprises. This in many cases may be a sound and wise endeavor regardless of integration.

Local electrical resources, such as electrical dealers, power company educational representatives, etc., should be utilized whenever there is an opportunity to show relationships of electricity to farming. Particular attention is directed to home equipment located in most high school home-economics departments. This is one area of integration that should not be disregarded in consideration of the farm.

Farm shop periods ordinarily give consideration to electricity to some extent. Needed is more emphasis upon those areas of integration which are becoming increasingly important to the modern farmer due to electrification and mechanization and as a result finding him dealing with problems that have not confronted him before.

There is much to be done in vocational agriculture relative to rural electrification — a job that if properly done should yield great dividends in safety, convenience, and profit to farm families. The teachers of vocational agriculture and farm mechanics, occupying the strategically important position that they do in farm communities, have here both an opportunity and responsibility. But to do their job, they must be well informed themselves about electricity and its uses. In many cases this may mean additional training on their part, and the reorganization of their course offerings to make room for greater emphasis on electricity, a much needed area of instruction.

Teachers who attended the 1955 Industrial Teachers' Conference at the A. & M. College of Texas, College Station, Tex.

The Troublesome Problem of —

Legal Aspects of Shop Accidents

CHESTER A. GAUSMAN
Instructor of Electrical and
Electronic Trades
High School
Lincoln, Neb.

School District Liability

As a general proposition, a school district, being merely an agency of the state, is not, in the absence of a statute imposing such liability, liable for torts committed by its trustees or employees. "A tort being a wrong." The general contention is one of "common law" that the school district is carrying out a governmental function and therefore not liable for any accident occuring in a school shop. This is true in all but three states of the United States. These three are Washington, New York, and California.

An example of a case tried in a state having no such statute arose in Ohio, in which a boy was severely injured while operating a buzz saw. In this case the court said:[1]

> In the absence of a statute specifically creating a civil liability, a board of education is not liable in damages to a pupil who is taking a manual training course in its mechanical department, and who suffers injury as a result of the boards failure to protect as required by law, the machinery used by said pupil.

In Wisconsin, in a case involving a shop accident, the plaintiff contended that under the Wisconsin statutes the school district was required to maintain a "safe place."[2] The court said:

> If the contention of the plaintiff is sound then every school room is a place of employment and every pupil is a frequenter, and the city or state maintaining the school, although acting in a governmental capacity, is liable for injuries sustained while in the course of receiving instruction.
>
> There is nothing in the 'safe place' statute which indicates that the legislature intended any such result. A person receiving instruction in a public school, whether the person be a minor or an adult, is not an employee and the place he received instruction is not a place of employment.
>
> It is not necessary to cite authority to support the proposition that the defendant was engaged in the discharge of a governmental function and therefore not liable for negligence of its employees engaged in the discharge of that function.

In the case of *Bragg* v. *Board of Public Instruction of Duval County Florida*, in which a student was badly injured in a printing press, the Supreme Court of Florida said:[3]

> The law may impose liability for tort on Boards of Public Instruction but the prevailing rule in this country is that they are not liable unless made so by law. This is the rule because they are engaged in a purely governmental function. The mere fact that the Board of Public Instruction is created a body corporate with power to sue and be sued does not affect its immunity from Tort.

The previously mentioned cases were all decided on *common law* rule. As stated all states except three have such constitutional provisions.

California has passed a statute imposing specific liability. Pol. Code 1623, as amended by St. 1923, P 298 reads in part: "Provided that school authorities should be liable in name of the district" for any judgment against the district on account of injury to any pupil arising against the district because of the negligence of the district or its officers or employers, and they must pay any judgment for debts, liabilities, or damages out of the school funds."

In a case tried before the Supreme Court of California in 1930,[4] the court held that this law was not only statutory authorization to school board to pay judgment, but it also gave students the right to institute action against the district to recover for injuries sustained as a result of the district's negligence.

A student was injured in a print shop in the schools of Seattle Washington in 1938, and in the ensuing case of *Banks* v. *Seattle School District No. 1, of Seattle, King Co.* the court said:[5]

> An action may be maintained against a county or other public corporations, either upon a contract made by such county or other public corporations in its corporate character, and within the scope of its authority, or for an injury to the *rights of the plaintiff* arising from some act or omission of such county or other public corporation.

In New York State the school district may be held liable for its own negligence but not for the negligence of its employees. The doctrine of "respondent superior" is not applicable. "A master is responsible for his servants actions." In the case of *Edkins* v. *Board of Education of City of New York*, the court said:[6]

> Shop work with the use of machinery by students in a vocational school is an "educational activity and interest" within statute imposing the duty on the board of education to purchase such "equipment" as may be necessary for proper and efficient management of educational activities under board's management and control, the quoted words include not only books and pencils but

[1] *Conrad* v. *Board of Education of Ridgeville T. P., Ohio*, 29 Ohio, App. 317, 163 N.E., 567 (1928).
[2] *Kirchoff* v. *City of Janesville, Wisconsin*, 38 N.W., 2nd 698, 255 Wis., 202 (1949).
[3] *Bragg* v. *Board of Public Instruction of Duval County, Florida*, 36 SO., 2nd 222 (1948).
[4] *Ahern* v. *Livermore Union High School, District of Alameda County, California*, 284 P, 1105 (1930).
[5] *Banks* v. *Seattle School District No. 1, of Seattle, King County, Washington*, 80 P, 2nd 235 (1938).
[6] *Edkins et al.* v. *Board of Education of City of New York*, 41 N.E., 2nd 75 (1942).

> protective clothing for child students similar to that furnished by employers to men performing the same machine shop operations in industry. Education Law No. 868, subd. 4, Labor Law No. 256.

The court held the school district liable for injuries received when a student's sweater caught in a lathe and the student was severely injured.

Whenever a school district is negligent in its duties it should not have the privilege of hiding behind the cloak of "common law" of nonliability. That the courts themselves feel this way is evidenced by the opinion given by Justice Terrell of the Supreme Court of Florida.[7] In which opinion he said:

> Some time in the future legislatures whose duty it is to provide such legislation will see fit to spread the damages occasioned by shop accidents and that society will be required to help bear the burden of such unfortunate incidents.

Why school districts should be allowed to install and allow students to use equipment which would be illegal in industry, or why inefficient instruction should be tolerated is difficult to comprehend. Perhaps some time in the future the several state legislatures will take it upon themselves to provide statutes similar to California's law and so assume some of the risk rightly theirs.

It is interesting to note that the vast majority of cases tried in the United States, on Tort liability of shop accidents against school districts, have been in the states of California, Washington, and New York. Perhaps the utter futility of such action in other states has kept the number of cases in other states to a minimum. This should not be construed to indicate sounder educational policy in those states where cases were fewer, but rather an indication of failure to accept a responsibility of a burden.

Liability of the Instructor

The instructor unlike the school district is not protected by the *common law* rule from suits for damages. There have been numerous cases involving instructor liability, and instructors of shops, generally speaking, are extremely vulnerable to suits for damages.

They are liable for negligence in duty. A teacher accepts the responsibility of "due care" towards persons under his direction and care. In the case of *Brooks* v. *Jacobs*, 1943, the following court action resulted:

Brooks was a senior in the carpentry class of George B. Jacobs. Jacobs had been instructor of this class for many years and was considered by the school as being very competent. At the time of the accident the carpentry class was constructing a vocational training building for the local high school. The electricity, mechanics, and plumbing classes assisted in the construction work. The students were not compelled to work on the new building; they could not if their parents objected. They received no compensation. What they did consisted of a part of their course work, for which they were given credit, and the time was confined to their instruction periods.

On the day of the accident (as claimed by the plaintiff) he and another boy were directed by the defendant to go to the building, then in process of construction, around all of which a temporary staging had been erected, and shovel off the snow from the staging. The defense claimed that on that particular day the boys requested the right and were permitted to do this work. In the performance of it, whether directed or permitted, the plaintiff, while on the upper staging, due to a breaking *ledger board* was *catapulted* to the ground and seriously injured.

The evidence nowhere disclosed who in fact selected and *nailed on* this particular ledger board. Although new, it broke transversely in the vicinity of a knot hole.

An issue arose as to whether or not the defendant had full charge of the construction. It did appear, however, by admission of the defendant, that he assisted in the selection of the site for the building and prepared the plans.

The plaintiff contended that the defendant, *instructor*, was negligent in his duty in not inspecting the scaffolding before allowing the plaintiff, *student*, to work upon said scaffolding. The court ruled that the evidence was sufficient for jury action and re-trial.

Justice Hudson of the Supreme Court of Maine said as to the instructor's responsibility:[8]

> An instructor accepting responsibility of due care toward persons under his direction and control, must exercise such care, not only as to what he himself actually does on observance of such duty, but as to what he fails to do which he should have done in the exercise of due care.

In a case occurring in 1949 in New York City, *Ohman et al.* v. *Board of Education of the City of New York, et al.*, an accident occurred while the teacher in charge was temporarily absent from the classroom for the purpose of sorting and storing an issue of schoolroom supplies. This was a routine task that formed part of her usual duties. The testimony as to the length of time the teacher was out of the room was conflicting. Whether for *more than an hour* as contended by the plaintiff or *less than a minute* as contended by the defendant's witnesses was not determined.

The plaintiff, Herbert Ohman sustained a severe permanent injury when struck in the left eye by a drawing pencil. The pencil was thrown by a classmate with the remark, "Here is your

[7] *Bragg* v. *Board of Public Instruction of Duval County, Inc. cit.*

[8] *Brooks* v. *Jacobs*, 31 A, 2nd 414, Maine, 1943.

Alpha Phi Chapter of Epsilon Pi Tau recently installed at Long Beach State College, Long Beach, Calif.

Front row left to right: Floyd Grainge, Carl Stickler, Carlton Ricker, James Plusch, Robert Barrow, James Ryan, Royce Cornett, Dr. Thomas Dean, trustee.
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Third row: Ray Sulack, Kerwin Jacobs, Russell Journigan, Gordon Hauck, Robert Ankerman, Virgil Delapp, Richard Powell, Chester Gromacki, Richard Hoffman, William Titmus, John Helps.
Fourth row: Verne Berry, Arlie Pirtle, Jerome Murphy, Ray Miller, Norman Meredith, Bill Macan, John Holmes, Edward Dahlen, and Stanley Jessop.

pencil." The boy for whom it was intended ducked and the pencil hit the plaintiff who was standing directly behind him. In ruling that the plaintiff was not entitled to recover damages the court said:[9]

> It does not follow that absence from the classroom was the proximate producing cause of the injury, which was due, as we see it, to the tossed pencil. Whether it was done mischievously and heedlessly or wantonly and willfully, or with the serious purpose of returning the pencil to its owner, it was the act of an intervening third party which under circumstances could hardly have been anticipated in the reasonable exercise of the teachers legal duty toward the plaintiff.
>
> Under common law standards, a teacher may be charged only with reasonable care of pupils such as a parent of ordinary prudence would exercise under comparable circumstance.

This case although a suit against the school district shows the thinking of the court on teacher liability. If any teacher negligence had been shown the school district no doubt, would have had to pay damages. In New York State such a suit is possible. However, in the majority of states any action would be more successful against the individual instructor rather than the school district.

Instructors have often been classified as "judgment proof" because of their relatively low income. This may account for the fact that fewer instructors are sued than one would anticipate from the numerous accidents occurring in our school shops.

R. R. Hamilton, dean, College of Law, University of Wyoming in his *Bi-Weekly School Law Letter* says in part:[10]

> I submit that the business of education has become so big that it is palpably unfair to saddle teachers and administrators with the risks involved in their respective positions. At least three states, New York, New Jersey and Connecticut, have enacted "safe harmless" statutes for the protection of teachers. These require the district to pay judgments recovered against teachers. This is enlightened legislation and should be adopted widely. The Tort liability laws applicable to districts, and to individuals responsible for the school program, are obsolete and cannot be defended in a modern society. It is unfair to everyone concerned to attempt to operate a 1951 "Cadillac" educational program under Model "T" Tort Liability Laws.

Factors Contributing to Accidents Resulting in Court Action

Of all the shop accident cases reaching Appellate or Supreme Courts of the various states, accidents in the carpentry and woodworking shops were most prevalent.

It might be said with some authority then, that in the operation of this particular shop, the instructor and school district should take, particular care. Fifty-five per cent of the total were such cases.

Buzz saw accidents accounted for a greater portion of the woodworking cases. An example of such a case occurred in California in 1943. In the case of *Ridge* v. *Boulder Creek Junior Senior High School*, the school district was held liable to the extent of $1,006.52.[11]

Walter Ridge injured the index finger of his right hand while operating a power saw without a guard of a fence upon it. Ridge knew what these objects were for, to prevent injury, but others in the class used the saw without the guard because the fence was broken. Ridge was not instructed not to use the saw without the safety devices, and the instructor and other students used the saw without the safety devices on some occasions.

The plaintiff alleged that the injury was caused by "the carelessness, negligence, recklessness and wilful misconduct of the said school district." The defense alleged that Walter Ridge was guilty of contributory negligence.

Wood planers or joiner accidents resulted in numerous other cases: *Bowman* v. *Union High School, District No. 1, Kitsap Co., Washington*. is a good example of one such case.[12] The plaintiff based his action on the following citation:

> Upon the day of the accident, the plaintiff, as part of his course of study and at the expressed direction of the supervisor in charge of said manual training department was in the act of constructing a dresser set. That in the construction of said set, it became necessary for the plaintiff to use certain pieces of machinery installed in the said manual training room, one piece of which is known as a joiner. and is commonly called a planer. This joiner was installed upon a platform and was driven by an electric motor. which caused the said joiner to revolve at a very high rate of speed. Because of the fact that this piece of machinery was inherently dangerous to life and limb, there was constructed a guard which worked automatically, leaving the blades of the joiner exposed only to the bottom surface of the board being planed and preventing small thin wood from passing over and upon said blades. At the time of the accident here stated, the said guard had been removed from the machine through the negligence, carelessness and wilful acts on the part of the defendant, its agent, servant, or employees, and the said machine was allowed to be operated without said guard, and in a very dull condition.
>
> The plaintiff, in attempting to plane a small piece of wood which was used in the said dresser set, caused the block to be placed against the planer, and due to the fact the planer was dull and there was no guard for protection the said piece of wood was torn from the plaintiff's grasp and his hand passed over and upon the said joiner, causing three fingers on his right hand to be completely severed.
>
> That the accident was not caused by an act of negligence on the part of the plaintiff, who acted under the direction and supervision of the supervisor, H. Hohnson, and further, the plaintiff did not know the dangerous condition the said machinery was in, nor did he realize at any time, that he was in danger, untill it was too late to avoid the accident.
>
> That the defendant was negligent, careless and wilful in that said guard which was formerly installed upon said machinery had been allowed to be taken off and remain off over a period of months, although this fact was known to the defendant, and the defendant knew that the said machinery was being used while so unguarded. That the blades on the said joiner were dull, and the defendant knew or should have known that the blades while in such condition, were likely to grab, causing injury to the user of the machinery. That the plaintiff was never warned relative to the dangerous condition of the machinery, although he was instructed by the supervisor to use said machinery, and it was necessary for him to operate the machine to complete his course of study. That the plaintiff was never instructed by the defendant as to the manner of operating the said machinery.

The court awarded damages to the plaintiff on basis of evidence of negligence on part of the defendant.

Ten per cent of the cases were results of accidents in print shops. Old obsolete equipment, hand fed, and treadle operated seemed to result in the most accidents.

In the case of *Banks* v. *Seattle School District*, Banks a student in the district print shop was injured. While operating a printing press, his foot slipped and was caught between the treadle and crossbar.

Charges of negligence were submitted

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[9] *Ohman et al.* v. *Board of Education of City of New York, et al.*, 90 N.E., 2nd 474 (1949).

[10] R. R. Hamilton, "The BiWeekly School Law Letter," Vol. 1, No. 5, Laramie, Wyoming, Apr. 26, 1951.

[11] *Ridge et al.* v. *Boulder Creek, Union Junior Senior High School, Dist. of Santa Cruz Co.*, 140 P. 2nd 990, 60 Cal. App., 2nd 453 (1943).

[12] *Bowman* v. *Union High School, District No. 1, Kitsap County, Washington*, 173 Wash. 299, 22 P., 2nd 991 (1933).

by the plaintiff. Failure to properly mount a press so as to give greater clearance between the treadle and the crossbar, and failure to equip the treadle with a guard which would prevent the operator's foot from slipping between it and the crossbar were charged. Subsequent to the plaintiff's injury, the defendant school district placed a guard on the treadle.

In reaching a decision for the plaintiff the court said:[13]

> There was evidence the foot treadle did not have the clearance it should and could have had. That it was practical to have a foot guard on the treadle, which was put on the treadle after the accident. Evidence that the district put guard on foot treadle of press after accident was admissable, not as evidence of past negligence, but to support contention that press could have been practically guarded.

Machine shop cases were not so frequent but accounted for 9 per cent of the total cases. The most common injury sustained was flying particles of metal striking the eye. In the case of *Goodman* v. *Pasadena City High School* in California, a student not a member of the class was struck in the eye by a flying piece of metal.

The shop was a spacious, well-lighted room. It was occupied by lathes, a forge, a furnace, and equipment for melting metals, tables, benches, old chassis, and sundry apparatus. It had been inspected by the safety engineer of the California Industrial Accident Commission, and, with all of its contents, it satisfied every reasonable safety requirement. LeRoy Goodman was assigned a seat in the corner distant from others to engage in work and was directed to "write up" a lesson. After completing his lesson, instead of observing the order of the instructor to report to him, LeRoy approached a position about 12 feet from a vise where three boys were pounding aluminum. In that position he stood for about three minutes when a piece of metal entered his eyeball, which ultimately resulted in its destruction. The students had been instructed to use goggles when using the emery wheel, but at no other work in the shop was it deemed advantageous to wear goggles for the protection of ones eyes. It was not shown that any instructor knew that goggles were necessary for the safety of a spectator within the shop.

The Plaintiff contended the school district was negligent in not providing goggles for all persons in the shop. The court decided in favor of the defendant school district and in its decision said:[14]

> The negligence suggested by plaintiff was the failure to require the pupils to wear goggles in the presence of the possible injury from flying particles of hammered metal. However, the record discloses no substantial evidence that there existed such danger which was known, or ought to have been known to the authorities. The law does not make school districts insurers of the safety of the pupils at play or elsewhere, and no liability is imposed upon a district under the abovementioned section, in the absence of negligence on the part of the district, its officers or employees." The fact that the students were attempting to carry out certain requests made by their instructor does not change the rule. In conducting classwork, a teacher must frequently give directions. While carrying out such directions, the students may, in many ways, act without due care. But for their negligence in such matters the statutes have not gone to the extent of imposing a liability on the school district.

In still another accident, a boy's sweater was caught in a lathe. While trying to keep from being pulled into the machine his hand was badly mangled. The court ruled in this case, *Edkins* v. *Board of Education*, that it was the duty, under New York Statutes, of the school district to provide adequate clothing for protection of machine shop students.[15]

So we see that in a machine shop as in other shops, the common causes of accidents could be prevented by use of proper equipment, proper supervision, and instruction.

It might often be construed by educators that accidents occurring in a night school program would result in different decisions by the court. However, *Kirchoff* v. *City of Janesville* in Wisconsin (1949) illustrates the decision of one court in such a case.[16]

At the time of the injury sustained by Fred O. Kirchoff, an adult, the plaintiff was enrolled in the night school of the Janesville Vocational School for the purpose of receiving instruction in woodworking. During such instructional periods the plaintiff was required to operate a wood planer.

The plaintiff contends that while in the "employment" of said school, wholly on account of the negligence of the defendant, its servants and employees in the course of their employment, his right hand and arm was caught in said defective and unguarded gearing and was severed below the elbow. The plaintiff based his case on the following points:

1. Failure of said defendant to provide a safe place for the said plaintiff to engage in his work.
2. Failure to provide, furnish, and use adequate safety devices and safeguards.
3. Failure to provide proper instruction in the operation of the planer and to warn him of the danger incident to its operation.

The plaintiff, by reason of permanent disability sustained and a substantial reduction in earning power and outlay

[13] *Banks* v. *Seattle School District, loc. cit.*

[14] *Goodman et al.* v. *Pasadena City High School*, 40 P., 2nd 254, 4 Cal. App., 2nd 65 (1935).

[15] *Edkins* v. *Board of Education of City of New York, loc. cit.*

[16] *Kirchoff* v. *City of Janesville, loc. cit.*

Alpha Psi Chapter of Epsilon Pi Tau recently installed at Los Angeles State College, Los Angeles, Calif.

Standing left to right: Glenwood Cummings, Paul Light, Richard Bowe, Elvin Hurst, Joseph Nivon, John Switzer, Leonard Pilleon, Peter Petris, Philip Lewis, Philip Breskin, Kenneth Larson, Ernest Navrides, Bruce Carnachan, Fred Mortensen, Clarence Form.

Seated left to right: Alvin Lappin, Hudson Royster, Homer Fetty, Willis Kenealy, William Warner, Claude Hihart, Richard Hoffman, and John LaMonica.

of expenses, asked for damages for the sum of $30,000.

The court ruled that a student, whether a minor or an adult, whether in day or night school, was not an employee, and the place where he received instruction is not a place of employment.

The plaintiff was not therefore entitled to recover damages as an employee. As a student, the district was protected by the "common law" rule and damages were refused.

Suits for damages caused by school shop accidents are in nearly every case a result of questionable actions on the part of the defendant school district or instructor.

Since instructors are particularly liable for damages, they should exercise extreme care in safety instruction, supervision and instruction of students, operations, and care of equipment.

The action of the instructor must be proved negligent, careless, reckless, or of the nature of willful misconduct before damages can be recovered.

As the cases cited have pointed out, an instructor's actions must be the proximate cause of the accident. Normally absence from a shop for legitimate reasons is not such cause. Neither is an instructor liable for accidents to students other than the members of his own class.

Whether the actions of the instructor are negligent must be decided by the jury or judge as the case may be.

To make the position of the instructor still less desirable, he has no better chance than a student to recover damages if he suffers an accident due to the school district's negligence in 45 of the 48 states.

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13. *Kirchoff* v. *City of Janesville, Wisconsin,* 255 Wis., 202, 38 N.W., 2nd, 698 (1924).
14. *Krutilli* v. *Board of Education of Butler District, West Virginia,* 99 W. Va. 466, 129 S.E., 486 (1925).
15. *Maede* v. *Oakland High School District of Alameda County, California,* 212 Cal., 419, 298 pp., 987 (1931).
16. *Ohman et al.* v. *Board of Education of City of New York, et al.,* 90 N.E., 2nd 474 (1949).
17. *Ridge et al.* v. *Boulder Creek Union Junior High School, District of Santa Cruz County, California,* 60 Cal. App., 2nd 453, 140 pp., 2nd 990 (1943).
18. *Sullivan* v. *School District No. 1, of City of Tomah, Wisconsin,* 179 Wis., 502, 191 N.W., 1020.

To Make Your Courses Interesting, Put

Textiles in the Elementary School Curriculum

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Schools designing the curriculum to help boys and girls be more effective citizens of our democratic society also plan for experiences which will help them appreciate and understand the highly complex machine-culture in which democracy operates. Educators find that industrial arts activities which supplement the social studies or curriculum unit make learning more meaningful through activities which use all the physical senses and contain a basis of concrete experience. Through industrial-arts activities and the conscious relation of them to our modern way of life, children are helped to adjust to our scientific-technological culture. Such adjustments, built upon sound understandings and active appreciation of technology, provide a basis with which youth can help to make our democracy more effective. The products of our textile industry are a great part of our everyday life, and because they represent so well the phenomenal growth of a simple process, experiences involving them should be a part of the elementary school curriculum.

The many processes and tools man has devised to change certain raw materials to clothe and protect himself comprise a large portion of modern industry. Among the facets of the textile industry are the growing of raw products, the chemical preparation of synthetic fibers, spinning, weaving and dyeing of fabrics, designing and producing finished products. The making of string, rope, carpets, and rugs are also considered textile processes. Many types of fabrics are manufactured from plant fibers such as cotton, flax, pine-

From left to right: Authentic replica of an Indian loom, learning how to spin flax, and a simple gin for preparing cotton

apple, jute, hemp and kapok; animal fibers such as wool, silk, camel's hair, mohair, and cashmere; mineral fibers such as glass, metallic thread, asbestos; and chemical-synthetic fibers such as nylon, rayon, dacron, and many others.

Teachers frequently ignore the fact that simple basic processes of textile manufacture can be reproduced authentically in the elementary school classroom. Almost any curriculum unit, whether it be a cultural study or whether it be a historical study of our own country, considers the clothing or costume of a group of people, as well as other products and influences of the textile industry. To introduce manipulative activities concerned with the industrial processes of preparing fabric and clothing will enrich the unit with "doing" processes and reinforce the learnings concerned with social sciences and adaptations to the environment.

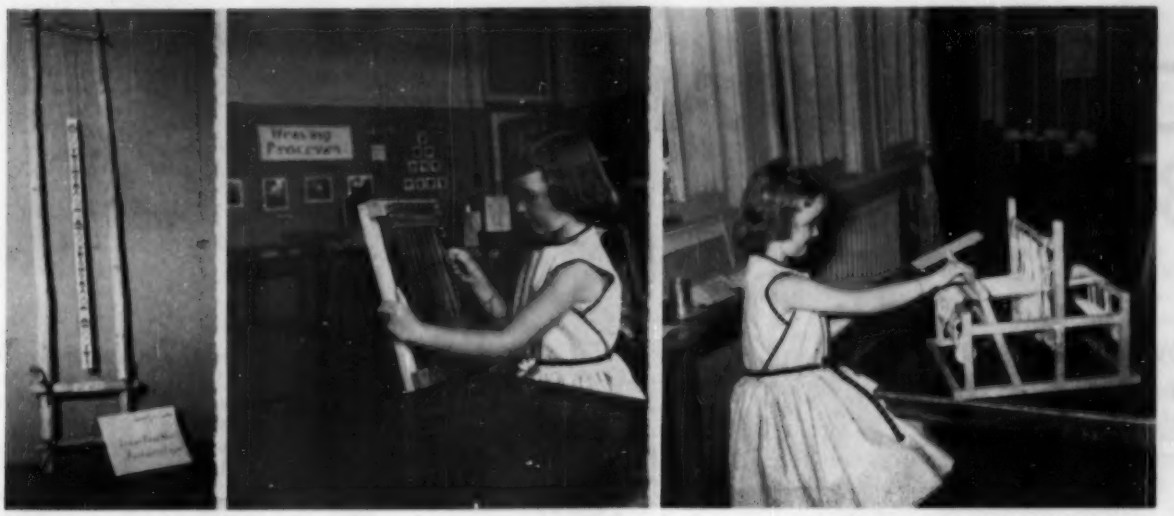
Examples of the textile phase of industrial arts which may be integrated within curricum-study units are numerous. When exploring such areas as the products grown, the influence of the climate on the region, or the costumes worn for festivals, children raise questions which involve textiles. They need to know more about the materials, tools, and processes which are developed as a result of geographical influences or social mores and customs. They need to relate and compare these customs to those of our own to build stronger appreciations of the world community.

Most elementary schools begin in kindergarten and first grade with units on the home and family life. In such units playhouses or small homes of orange crates are frequently fashioned. Basic principles of weaving can be introduced through the making of waffle-weave or plain-weave rugs on simple weaving frames for the playhouse or model home. Children in kindergarten can easily understand the principles of interweaving yarn or thread to form durable material. They can find the threads (of the warp and the weft) in their own clothes, the drapes in the room, and all other fabrics around them. Sometimes teachers introduce small children to the different *feel* or texture of various kinds of fabrics, and let them experiment with design in potato prints or other media. Kindergarten children can watch the dyeing process with understanding when commercial dyes are used, and sometimes they can do much to help in dyeing cloth for the preparation of curtains or table cloths or mats. One group experimented with the natural dyes of beets and berries, giving children insight into primitive methods of giving color to cloth.

Similar activities as those used in kindergarten and first grade can be included in second- and third-grade studies of farm and community life, for again small houses and buildings are constructed for dramatic play. In these units children can study the difference in clothing needed for different jobs, as the milkman and fireman. Why does the milkman wear white? How is the rubberized suit of the fireman made? Experimenting to find the answers to these questions helps to develop social understandings as well as industrial understandings. The use of various fibers for articles such as ropes and hoses also gives enrichment to the understanding of textiles and appreciation of different tools needed for different ways of working.

Third- or fourth-grade social studies units usually consider Indians of the home region or a specific muscle-power culture as Pueblo Indians or Rural Mexico. Almost every primitive culture had its own looms for weaving cloth or rugs; children can find branches to make authentic replicas of the loom representative to the culture they are studying. This loom can then be used to produce fabrics with authentic designs. Looms for bead weaving, appropriate to some Indian cultures, fascinate children of this age. In what better way can children appreciate the artistry and crafts of a specific people, as well as to understand the hours of labor needed to make articles necessary to life? At this level also, experimentation with natural dyes and various fibers can enrich the study. The use of plants, fruits, and minerals employed by the Indians of the region to decorate are easily duplicated by boys and girls. The making of mats and baskets after preparation of such materials as grasses and cattails or perhaps corn husks is another weaving process related to primitive cultures. Usually the preparation of reeds, corn husks, and similar materials consists only of careful drying, then soaking in water just before weaving to make the fibers pliable.

The study of early American history, pioneer life, and the westward movement is often made in the fifth grade. This is a rich area for industrial-arts activities about textiles. Since the early pioneer woman spun her own yarn and wove her own fabrics from the materials her husband supplied, such activities became a major part of pioneer life. To understand more effectively the life of the pioneers, children can prepare the tools and actually ret, break, scrutch, hackle, spin, and weave flax. Probably an authentic flax spinning wheel will have to be borrowed, but no doubt someone in the community can be found to give a demonstration, for we find more and more people who are reviving the art of spinning. The children will enjoy learning to use this tool of the textile industry. An easy loom for fifth graders to construct is the simple box loom, complete with



From left to right: Authentic replica of an Indian bead loom, weaving on a simple frame loom, and weaving on a one-harness loom

beams, harness, and shuttle, and resembling that used by the early pioneers. Wool and cotton can be prepared in similar fashion: washing, carding, and spinning done with the same tools. A simple cotton gin can be constructed to remove the seeds before washing. A large wool spinning wheel can be used easily by children for both fibers. Wool cards usually can be found and borrowed from someone in the community, or they may have to be purchased, perhaps by the library or by the audio-visual department of the school. Again, experiments with natural dyes on the woolen yarns spun by the children would be most appropriate to this study.

Modern industrial life and urban living are frequently considered at the sixth-grade level. Here is a natural place to study modern technical methods of spinning, weaving, and dyeing, as well as the complexity of design. The interdependence of agriculture, transportation, research, labor and consumer demand on textile industries becomes an important consideration. Geographical features which affect production of wool, cotton, flax, etc., and industrial facets which govern production of synthetics are also important ideas to examine. If the children have not experienced the fifth-grade activities listed in the foregoing, such experiments will help the understanding of principles basic to complex machine processes.

European studies are also adaptable to consideration of textile processes. The Scandinavian people and the Swiss are particularly noted for their weaving and textile handwork. Authentic designs and decoration of fabrics which distinguish the products of various countries should also be noted. In the study of Asiatic peoples, many interesting experiments can be made with silkworms and their cocoons.

Studies of transportation may not be, on the surface, appropriate to textiles. But when children explore the jobs of the people who work on airplanes or trains or boats, the consideration of the kinds of clothing they wear for their specific jobs will include some of the most modern inventions in synthetics and rubber and other materials for protection from the elements and industrial hazards.

Only one phase of the broad industrial-arts program which should be included in the elementary school curriculum is discussed here. Many others could be presented in some detail, but the important factor is the awareness of the teacher to industrial-arts activities and her understanding of their contribution to the general education of children. No matter what unit is scheduled to be developed, it will be done in a different way by each teacher because of her own experience and the background of the group she teaches. If the teacher has an earnest desire to make her program rich and meaningful, however, she will guide her group in active, experimental activities which deal with the tools and processes man has created to change raw materials for his use.

Sources of Material

Flax: Oregon Flax Industry, Salem, Ore.

Wool: National Wool Growers Association, Salt Lake City, Utah (or other local associations)

The Salvation Army sponsors "Golden Age Clubs" which do spinning and other handcraft activities.

The New York State Historical Association, Cooperstown, N. Y., sponsors an outstanding museum and also publishes much material and makes available exhibits for loan.

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Petroleum has helped to create chemicals that are making profound changes in the agricultural world. Chemicals from petroleum, called "petrochemicals," go into herbicides, soil conditioners, fungicides, defoliants, growth regulators, and insecticides. These are used in the farmer's fields and barns to improve crops, increase yields and lessen the farmer's labor. They have enabled the American farmer to set another world's record this year in farm productivity. — *Petroleum Newsnotes.*

There is a highway accident every three seconds in the United States, and "I didn't see," is one of the most common explanations. — *American Optometric Association.*

Something That All Teachers Know —

Grading Will Always Be a Problem

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Since the dawn of educational history, grading has been a difficult task for every teacher. Perhaps it is destined to be so. Progress has been made toward better and more accurate grades; however, it still remains largely subjective, and full of flaws that often harass the teacher.

Whether grades will ever become foolproof is a debatable matter. And yet *grades should be defensible;* by this the writer means that when a student comes in and asks why he received a *D* the teacher can bring out evidence to him and to his parents that add exactly to a *D*. Every teacher should be able to defend the validity of his grade.

A very important objective of teaching is to discover what progress a student is making in a class. How far a student has traveled under the teacher's tutelage and guidance, is a question that seldom is answered objectively.

Newkirk and Stoddard in their book *The General Shop* state that "educational tests have won for themselves a secure place in the school program. The testing movement has not attained the same proportions in all school grades nor in all school subjects. A few have been published in the special field of industrial arts." Prominent teachers readily admit the shortcomings and inconsistencies that are involved in giving grades.

The writer does not profess to be an authority on grading. However, experience and experimenting with different methods of grading have proved beneficial. The author concludes that the oftener a teacher checks the student's work, the more grades that are given per week for each individual student, and the more traits that are graded, the closer is the grade to being objective. Giving students grades on several items increases the validity of the final grade.

The following method has proved very satisfactory and the facsimile of the card will explain its function.

The card is self-explanatory; it sets up five items to be graded weekly on the 5-4-3-2-1 basis. These weekly grades can be gathered from marks out of the daily grade book. The marks at the end of the grading period are averaged and one grade derived.

The sample card is made out for a nine-week grade period. Thus four of these cards give the year's work for each student. Schools using the six-week grading period would use six cards during the year per student.

Profile charts or progress charts can readily be made from this marking card by incorporating (1) weekly averages, (2) weekly trait mark, and (3) the nine-week final grade.

NOTE:

Speed includes output and quantity of work.

Accuracy includes correctness and precision.

Quality includes design, appearance, and workmanship.

Attitude includes co-operation, mental reaction, and shop habits.

Knowledge includes resourcefulness, tests, and recitation.

In conclusion, the writer believes that the following items or objectives should be kept in mind whenever grades are given out and whenever evaluation takes place.

1. To discover the status of the learner in comparison with other students.
2. To check on teaching efficiency.
3. To measure progress of a pupil from a given point.
4. To motivate learning process.
5. To diagnose pupil difficulties.
6. To determine a grade for the student.

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Name..... Grade..... Final Grade.....

Public Schools

Industrial Arts Department
Stillwater, Minnesota

A	B	C	D	F
5	4	3	2	1

Trait	1	2	3	4	5	6	7	8	9	Av.
Speed										
Accuracy										
Quality										
Attitude										
Knowledge										
Weekly Av.										

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A Real Problem Is This —

Training Crisis

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In the February 14, 1955 issue of *American Machinist* there was a noteworthy article, "Train Diemakers or Die"; a special report by Jack Kleinoder, chairman of the Apprenticeship Commission of the National Tool and Die Manufacturers Association.

There have been other pertinent articles written in previous years, such as 1934, "Skilled Men are Scarce," "Lost-Skill and Ambition," in 1935 "Sees Growing Lack of Skilled Labor" and in 1940 "Industrial Heads Begging for Trained Machinists."

Notwithstanding this there has been a growing trend of many large and small industrial establishments to abolish machinist apprenticeship training opportunities. On the other hand there has been an increasing demand for machine hands or operators who can be quickly trained to handle a machine for one or two operations only, on a piecework basis with schedules of high pay. This has discouraged many likely young men from taking a four-year apprenticeship at lower pay, even though they would be more capable as journeymen.

There has developed a large number of machine operators with less skill, and continued diminishing numbers of trained or skilled machine or toolmakers with the know-how. The influx of trained men by emigration has decreased, opportunity and interest of young men to learn a trade has lessened and the death of skilled men has taken its toll.

Vocational and trade schools have attempted to fill the gap, but have found it more difficult to obtain, train, and place good prospects, because of the attraction of high pay for semiskilled jobs and the low pay given to apprentices.

Many industries have continuously advertised locally and in neighboring States for skilled men, specifying required experiences. Where, may I ask, are candidates for such jobs going to get their training or experience? On inquiry, the author has found that such ads have had either too few or no applicants. Many plants have had to turn down prospective contracts because of the lack of journeymen machinists, toolmakers, or diemakers and even turret and lathe operators as well as other skilled workmen.

It certainly seems that there will be a time when industry is going to reach a severe crisis unless something is done separately or collectively in training a reservoir of skilled machinists. Designs or ideas of mechanical parts may be the brain children of engineers but somebody has to have the ability to produce them, tool up for them and repair and replace the tools.

We continually talk about these shortages but nothing concrete has been done to meet the situation, materially or economically. There has got to be an awakening to the gravity of the situation, both locally and nationally.

Summer School Need Not Be All Work —

Professional Improvement Can Be Fun

CLAUDE "MIKE" WALN
Chairman, Public Relations
Sheet-Metal Instructor
Boise, Idaho

There is evidence available to show that people who play hard also work hard, and that the quality of the work they do is superior. The old saying, "If you want a good job done, ask a busy man to do it," is true in professional improvement of teachers. The members of the Colorado A&M Trade and Industrial Club are all busy men.

This T&I Club, made up of all trade and industrial education majors on the Colorado A&M campus, was founded by Harry A. Tiemann in 1927. At that time the members of the club rented a fraternity house for the summer and T&I men lived together. The philosophy of such vocational leaders as Charles (Skipper) Allen, C. A. Prosser, Tom Quigley, Herb Heilig, and many others, was always the subject of, or a part of the "bull sessions" held at all hours of the day or night. When the club became so large it was impossible to house all members, the activities were moved to the Colorado A&M Student Union building and members obtained housing in college dorms or private

homes. A few men continue to live in the Kappa Alpha Theta house during the summer terms and have kept alive the "bull sessions" that have been so valuable to many instructors and administrators in the Trade and Industrial field. Present activities of the club include a weekly noon luncheon at which outstanding leaders in education are invited to speak to the members and their guests. This feature has been especially well received by club members and they rarely miss a luncheon.

T&I Club parties are also well attended each week. This party for the families of club members is set up so children may play games, listen to the radio, or watch television. Usually the adults take part in the square dance activities which are essentially a part of the West. Cards are available, and usually large quantities of punch are consumed.

Baseball teams compete for the title of "champions." Our captain recently announced that, "We made 7 runs the last game while the opponents made 17." He thinks if we continue to improve we may win a game next summer. The bowling team was elated since they had beaten the home economics girls last week.

One of the features of each four-week activity is the family picnic. Special games and prizes are available for the children as well as all the food anyone could desire. This picnic gives everyone a chance to participate in an activity they enjoy — *eating*.

Each year, and only once a year, the Ancient and Honorable Order of Hoboes hold their international convention at Colorado A&M. This organization made up of businessmen, male students, and faculty dressed in hobo costume meets on the campus. After preliminary instructions, they descend on the town of Fort Collins begging and panhandling the people on the streets and in the stores and office buildings. This year, $467.59 was collected from the onlookers. Prizes are awarded for outstanding hoboes, and all money collected is used for charities not provided for by other organizations such as: Red Cross, March of Dimes, Community Chest, etc. Following the collection of money, all hoboes and neophytes gather in the jungle by the river and the neophytes are properly inducted into the order. After initiation, all gather at the large pot of stew. Everyone eats out of tin cans; the neophytes use a stick for a spoon. The stew is prepared by a local member of the order.

Honorary fraternities active in the summer include Iota Lambda Sigma for majors in distributive education, industrial arts, and trade and industrial education, and Alpha Tau Alpha for vocational agriculture majors.

While the Trade and Industrial Club is discussed in this article, there are other clubs on the campus which carry on similar group activities; namely, the Agriculture Education Club, the Distributive Education Club, the Homemaking Club, the Industrial Arts Club, and others. In addition there is a general college activity program which provides free bowling, table tennis, billiards, or swimming each week. Once each summer, a general all-college picnic is held.

The counterpart of the T&I Club is the Lady TIC's. Once each week, afternoon parties are held by the wives of the T&I Club members. This usually consists of a dessert luncheon or a complete luncheon followed by cards or visiting.

Many children and adults enroll in a course in horsemanship classes or enjoy horseback riding while other members of the family are working toward a degree.

Special features off campus which are always well attended by visiting faculty and students include: Central City Opera in the ghost mining town of Central City. Frontier Days at Cheyenne, Wyo., 40 miles from Fort Collins, is an outstanding western rodeo. Sometimes spoken of as the "Daddy of Them All," this event includes parades, contests, rodeo, and a full week of entertainment. The Denver Post Opera is held at Cheesman Park in Denver. The admission is free and families usually take a picnic supper with them and arrive at the park between 5:00 and 6:00 p.m., eat their picnic supper, and enjoy the park while waiting for the opera. The Red Rocks Concert at the Red Rocks Amphitheater, a large outdoor theater, capable of holding 12,000, is a popular attraction. The picnic supper feature is also a part of this activity.

Other attractions include: 4th of July Rodeo at Greeley; Wild West Rodeo at Broadmoor, Colorado Springs; Estes Park Rodeo; Burro Race at Leadville, a ghost mining town on the top of the Continental Divide; and the Aspen Institute programs at Aspen, Colo. There are many more attractions throughout Colorado and information regarding them is available in Fort Collins.

Many students wish to fish for mountain trout and lakes are within driving distance, in addition to the Big Thompson River, the Cache La Poudre River, and the Laramie River. If a person wishes to go further into fishing country, there are many places in Western Colorado. Colorado A&M College attracts students from every state in the U. S. and also from many foreign countries. Summer school instructors are selected from the outstanding vocational educators in the nation. Many students have said, "You have many fine social activities which we enjoy, but we come to Colorado A&M because we appreciate the opportunity to meet and work with others who have had such broad experience in our field."

Permanent faculty members have shown an interest in providing an excellent staff and in helping us with our problems, and at the same time have improved the scholastic standards of the school. If you want a real experience in professional improvement, meet us at the Colorado A&M Trade and Industrial Club next summer. Past President Arnold McKenney and President Alex Kennedy will be there to greet you.

Something to Add to the Graphic Arts Course —

Lithography Demonstration

L. W. TANA
Graphic Arts Instructor
Joseph Pulitzer Junior High School
New York City

If we are to give our students a comprehensive picture of the graphic arts we must of necessity familiarize them with the three basic methods of printing. Relief or letterpress printing presents no problem at all; being the backbone of the graphic arts shop and the major area of our school shop. Intaglio or gravure is presented through the use of celluloid etching or through the use of the Swan Etching Kit.

Planographic or lithographic printing was the missing link in the trio, albeit that it is making great strides as the method of printing today. For many years the problem of demonstrating the

actual process and principle of lithography to our students has been rarely obtainable within the limited scope of facilities available in the junior school shop.

With the advent of inexpensive multilith plates the problem has become very much simplified. This demonstration uses a paper plate, the Direct Image Plastiplate manufactured by Remington Rand. This plate although made of paper has body to it and will stand up during moistening and various inkings in this demonstration. The Plastiplate is grained and extremely sensitive to grease, so much so that if the oil from your hand is transferred to the plate it will appear on the finished print. The grained surface of the plate reacts as a lithographic stone would to a lithographic crayon, the slight grain holding the particles of the greasy crayon.

Aim: To demonstrate the principle of lithography and to develop a knowledge of the three basic methods of printing.

Some Suggested Motivating Questions

Motivation: How would we print the name of a product on a tin can? Would there be danger of smashing type by printing directly on the can or is there another method of printing? What is the method used for printing textiles? How are famous paintings reproduced thousands of times?

"We know about printing from a raised surface (letterpress), and about printing from a cut in (intaglio) surface; can you picture printing from a flat surface? Printing from a flat surface (planographic) is exactly the method in which lithographic printing is accomplished, etc.

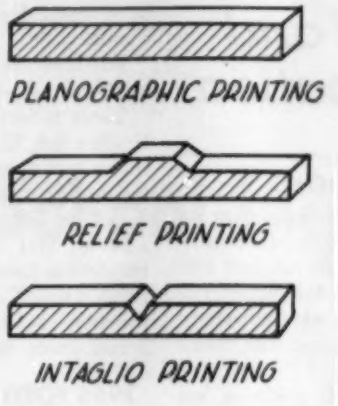
Preparation: Review the three methods of printing and present examples of printed matter in relief, intaglio, and planographic processes.

New terms to be learned: relief, lithography, intaglio, planographic, half tones, offset.

Presentation: Pupils have a background from related information talks; an introductory talk on recognizing the need for the three basic methods of printing.

Demonstration:

1. *Drawing directly on the plate:* For original designs the image can be drawn directly on the plastiplate with a lithographic pencil. However, the plate will act as a negative, therefore some illustrations and of course lettering must be drawn in reverse. In drawing directly on the plate, the hand must be kept from touching the sensitive plate; this may be done by placing a paper towel between the plate and the hand.



2. *Transferring and reversing onto the plate:* Transtrace is a thin sheet of paper with yellow wax which will transfer an image on Direct Image Plastiplates. This tissue is placed over the plate with the greasy side in contact with the white or printing side of the Plastiplate.

For a true original reproduction, the subject can be drawn on ordinary tracing paper and traced on its reverse side onto the plate with a piece of Transtrace between it. Aside from using a lithographic crayon for direct drawing on the plate, a pencil or a ball point pen has been found satisfactory in making the tracing. If one wishes to letter directly on the plate it has to be in (negative) reverse. This can be accomplished by drawing on the back (gray) side of the plate with a ball point pen with the white side of the plate in contact with a sheet of Transtrace with the wax side up.

3. *Etching the plate:* The etching process simply involves the washing of the lithographic plate with a piece of cotton using either of the following: Platelch, the recommended medium, although ordinary tap water was found to be satisfactory etch. However, Plastletch may also be used as a cleansing medium.

4. *Printing the plate:* A lithographic print may be made with the *Swan Etching Press* or the proof press, providing a type high base (use an old printing plate) on which to place the plate for printing is used. While the plate is still damp, place it on a newspaper, and ink it with the proof press brayer. After experimentation with the job, half-tone, bond, and multilith ink it was found that job and half-tone ink could not produce a satisfactory print because the inks did not have a sufficient affinity for the grease image. Contrary to all lithographic principles, it was found that bond ink will make as good a print as could be made with multilith ink, and that coat or calendered stock will give a better print than if antique stock is used.

Summary Questions:

1. Does oil and water mix?
2. What is lithography?
3. Where was lithography invented?
4. What is the principle of lithography?
5. What kind of plates are used?
6. What type of printing lends itself best for the lithography process?

Safety: Instructor will emphasize safety factors as they appear in the demonstration.

Student Project: Pupils may draw cartoons on Plastiplates and make prints. Projects in this medium may be used in very much the same way as linoleum and celluloid etching projects. Here the pupil creates his own design and carries the project through to completion. The final print may be mounted and framed. Lithography is identified by clear sharp lines which are a soft even color; the technique is well within the ability of junior high school students and will open to them another avenue of creative expression.

INDUSTRIAL EDUCATION IN THAILAND

The men shown in the photograph are now studying industrial education at Wayne University, Detroit, Mich., and have as their foremost objectives the development of skills in industrial arts and the learning of professional aspects of administration and teacher education within our philosophical, sociological, and economic framework. The development of a program of industrial education in Southeast Asia by these men is recognized as being more than the development of manipulative skills; for it is hoped that educational programs of this type will foster the cultural and economic advancement of these countries. These men are also concerned with the many implications of the industrialization of Thailand.

Siritusanakul and Subhab plan to return to their positions in Thailand after studying various educational programs in the United States this summer. Before coming to Wayne in January, they studied for one semester at the University of Indiana. Pangphuthiphong and Sindhusake studied at New York State College for Teachers at Buffalo, N. Y., this past fall, and plan to remain at Wayne University for one year to complete work for the master of education degree.

Industrial educators from Thailand

From left to right: Pichai Siritusanakul and Vivek Pangphuthiphong, both of Bangkok, Thailand; Ralph Bohn, instructor in industrial teacher education, Wayne University, Detroit; Vidhya Subhab and Pin Sindhusake, also of Bangkok.

Industrial Arts and Vocational Education

JOHN J. METZ, Editor

AN OPPORTUNITY FOR STUDENTS

Instructors of industrial arts and vocational education on the whole, are known to go way out to help their students to better their opportunities in every way possible. As their students approach high school graduation, these instructors frequently are asked by the students themselves what university courses might be most appropriate, for the vocational choice the boy has already made.

This phase of educational and vocational guidance has helped many shop teachers steer some of their better students into the profession of teaching. But there are many other vocations into which teachers can introduce their students by the right kind of assistance.

Besides this kind of help the teacher can advise pupils what and how to apply for scholarships of which there seem to be more now than ever. Both universities and industries liberally offer these aids to students but it seems that many talented high school graduates know little about them, and hence these scholarships go begging.

At the Illinois Institute of Technology, for instance, full tuition scholarships are offered by many local Illinois Tech alumni clubs. To be eligible for consideration, the candidate need only be a graduate of an accredited high school and have been in the upper half of his class.

Then there are numerous industrial firms who offer scholarships for residents in their own community or area. These scholarships may be for one year or for longer terms.

Teachers should equip themselves with information about these aids so that they may help those students who are worthy of receiving help of this kind.

NEW LIST OF INEXPENSIVE TEACHING MATERIALS

Dr. Chris H. Groneman, head of the industrial education department, school of engineering at the Agricultural and Mechanical College of Texas, College Station, Tex., has again taken up the Herculean task of listing inexpensive teaching materials for teachers of industrial education.

The last article on this subject by this author was published in this magazine in the April, 1952, issue. The new list starts on page 242 of this issue. It will be completed by about January, 1956, and will contain approximately 6000 entries.

The author has tried to make it as complete as possible, but it is expecting too much to imagine that some items, that may be quite important to some readers, have not been omitted. If that has happened we apologize most heartily. We hope, however, that the present list is as helpful as the previous ones have been.

VOCATIONAL EDUCATION APPROPRIATION RAISED

The eighty-fourth Congress of the United States is to be highly congratulated for its foresight in appropriating $26,500,000 for the 1956 fiscal program for vocational education.

It looked extremely gloomy when the President recommended a 25 per cent cut of $4,524,391 for the fiscal year 1954, and proposed a gradual annual reduction that would have resulted in the final elimination of the George-Barden Funds.

But now the future for vocational education looks much brighter.

There is further available under provisions of the Smith-Hughes Act, $3,014,662.44 for agriculture; $3,034,434.74 for trades and industry and home economics; and $1,089,233.04 for teacher training.

Senator John C. Stennis, (D) Miss.; Cong. Winfield K. Denton, (D) Ind.; Senator Lister Hill, (D) Ala.; Cong. Henderson Lanham (D) Ga.; and many other members of the National Congress deserve great praise for their efforts to preserve vocational education for the people of the United States whom they represent.

1955 FORD MOTOR INDUSTRIAL ARTS AWARDS

Approximately 700 youths have been selected as winners in the ninth annual Industrial Arts Awards competition. Awards given to them will total $50,000.

Thirty projects out of 5000 entries in the Industrial Arts Awards finals will receive outstanding achievement awards.

California winners received 141 cash awards and nine outstanding achievement awards. Illinois and Pennsylvania both had 78 winners. Ohio had 53, Indiana 47, Michigan 46, and New York 38.

Besides the states already mentioned Arizona had 11, Arkansas 5, Colorado 2, Connecticut 15, Delaware 3, Florida 3, Georgia 3, Iowa 4, Kansas 10, Louisiana 2, Maryland 12, Massachusetts 19, Minnesota 11, Missouri 11, Montana 1, New Hampshire 1, New Jersey 14, New Mexico 5, North Carolina 9, Oklahoma 4, Oregon 10, Rhode Island 3, Tennessee 6, Texas 21, Utah 10, Virginia 9, Washington 7, Wisconsin 14, Washington, D. C., 5, Hawaii 1, and Ontario, Can., 4.

A panel of 29 leading industrial educators and craft experts judged the Industrial Arts Awards entries and selected the 712 cash award winners. Most of the entries they reviewed had been judged as the best of more than 40,000 projects entered in IAA regional competitions earlier this year.

Winners of the 32 top awards and their instructors will be Ford guests for three-day, expense-paid trips to Detroit and Dearborn in September.

A LAST HOUR SUGGESTION

Readers are reminded once more to notify the circulation department of The Bruce Publishing Company of their new address for the school year 1955–56. Failure to do so may result in the loss of one or more issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

As previously stated, misdirected magazines may not be, and frequently are not returned to the publisher, and in most cases he will not be able to replace them.

FOR THE READERS' AID

To make it easier for subscribers who wish to request information on products, services, booklets, and catalogs, this issue introduces a new "Readers' Service Section" on the last two pages inside of the rear cover.

Readers are invited to take advantage of the easy-to-use, postage paid cards in sending for material on equipment and supplies needed to carry out the educational objectives of industrial arts and vocational education. The cards are perforated so that they may be detached easily.

Get Your Students Science Minded —

Senior High School Electronics

JOSEPH MURRI

Abraham Lincoln High School
Philadelphia, Pa.

In a changing technological world, the school should be prepared to meet the new needs of society and of the individual. It is of paramount importance that the youth of today who will be the leaders, the producers, and the consumers of tomorrow, be given an education which includes up-to-date knowledge and experiences. Education in general, and particularly secondary education, cannot remain static; it must change with a changing society.

The electronics instruction described here is to be given on an industrial-arts unit shop basis. It is intended to be administered in senior high schools, and in grades ten, eleven, and twelve. It should be given to all youth; girls as well as boys, and to those in the college preparatory as well as to those in the noncollege preparatory curricula. The time to be spent in the electronics shop should be approximately two to ten 45-minute periods per week for at least 2 semesters; the time depending on the needs, interests, and objectives of the individual. In some of the modern high schools, the academic boys and girls are permitted to take shops as electives. The noncollege boys and girls are generally assigned to various shops, and permitted to spend six periods or more in a shop of their own choice during the last two semesters.

Senior high school pupils differ in abilities, intelligence, and interests. Some pupils, through their own efforts, have acquired a great amount of knowledge of electricity and electronics as a result of their experience with amateur radio and other hobbies. Therefore, the course of study should be fitted to the pupil and not the pupil to the course of study. The instructor should possess a wide range of knowledge and experience in electronics if the instruction is to prove interesting and effective. This makes it necessary for an instructor to have had technical training besides training in education.

The electronics shop should be equipped with up-to-date equipment and should provide facilities for different levels of instruction and activities. Safety instruction should be given, particularly with high voltage equipment and in the handling of large vacuum tubes.

Definition of Electronics

In a broad sense, all electrical conduction involves electrons. However, the common accepted definition of electronics is: "that branch of science and technology which relates to the conduction of electricity through gases or in vacuo."[1]

Field of Electronics

The field of electronics includes many divisions which represent a variety of applications. The main divisions are communications, industrial measurement and test equipment, controls, medical, and various military applications.

It is almost impossible to teach youth all the different phases of electronics. The intent of industrial arts is not to produce skilled workers in the various fields, but rather, to furnish youth with learning experiences which will assist the students to understand the industrial and technological aspects of the electronic field.

Objectives in Electronics Instruction

1. Acquiring an understanding of the materials and methods in the field of electronics.
2. Developing ability in reading basic electronic diagrams.
3. Developing ability in the use of the more common tools.
4. Acquiring skill in making good soldered connections.
5. Developing skill in wiring simple electronic circuits.
6. Acquiring an understanding of the theory of basic electronic circuits.
7. Developing habits of safety in handling electronic equipment.
8. Developing skill in using test equipment.
9. Developing habits of good orderly procedures in planning and executing electronic projects and installations.

Instructional Methods

Since it is necessary for the instruction to be individualized, the number of pupils in a class should not exceed 20. The most practical and efficient method of administering instruction is by the use of instruction sheets. They may be in the form of information sheets, job sheets, assignment sheets, operation sheets, and test sheets. The instruction sheets should be written in clear and concise language, preferably illustrated with sketches and diagrams. They should be hectographed or mimeographed on 8½ by 11-in. sheets, so as to be readily inserted into a three ring loose leaf notebook. Instruction sheets should include questions; written answers should be submitted by the pupils.

Assembled classroom instruction should be given for discussing problems common to all members of the class, for major demonstrations, and when using various visual aids. An occasional trip to an industrial establishment is very helpful in developing interest and for furthering learning.

The project method of instruction is well adapted to industrial-arts instruction. It develops interest and gives rise to a need for learning individual units which are associated with the construction of the project. The instruction becomes much more meaningful to the pupil, and he is highly motivated in completing his assignment. Repairing of electronic equipment such as radios, televisions, sound equipment, and other similar equipment, should be treated as an instructional unit. They should be assigned to the more capable pupils and should be properly reported as an instructional assignment.

[1] *American Standard Definitions of Electrical Terms* (New York: The American Institute of Electrical Engineers, 1941), p. 231.

A planning area of the electronics shop should be provided with tables, chairs, and a bookcase having a collection of electronic books and pamphlets.

Course Outline

The course outline should serve as a guide; it represents a list of instructional units from which to draw for meeting the needs of an individual. It should not become static, but should be revised from time to time as experience dictates. A pupil should be assigned units which fit his abilities, interests, and demands. Therefore, it is not necessary to follow the numerical sequence of the outline; but rather, to fit the instruction to the pupil.

The first meeting of the electronics class should serve as an exploratory period for the instructor in which he should collect information relative to the interests and previous experiences of the pupils, particularly in reference to their previous experiences with electricity and electronics. This information may be obtained by a short written exploratory objective test. The instructor should also describe to the pupils the course and the shop procedures.

Items of Information

A. *Electricity and Magnetism*

1. Nature of electricity: (*a*) basic methods of producing electricity, (*b*) law of electrical charges, (*c*) conductors, (*d*) insulators.
2. Basic electrical units: (*a*) coulomb, (*b*) ampere, (*c*) volt, (*d*) ohm, (*e*) watt, (*f*) ohm's law, (*g*) wattage law.
3. Circuits (direct current): (*a*) series, (*b*) parallel, (*c*) series-parallel.
4. Batteries: (*a*) dry cell, (*b*) lead storage cell, (*c*) cells in series, (*d*) cells in parallel.
5. Magnetism: (*a*) lodestone, (*b*) law of magnetic poles, (*c*) permanent magnets, (*d*) temporary magnets, (*e*) uses of magnets.
6. Electromagnetism: (*a*) magnetic field around a single conductor, (*b*) magnetic field of a coil, (*c*) relation of current strength to magnetic field, (*d*) relation of number of turns to magnetic field, (*e*) uses of electromagnets.
7. Electrical meters (direct current): (*a*) voltmeter, (*b*) ammeter, (*c*) ohmmeter, (*d*) wattmeter, (*e*) watthour meter.
8. D.c. generators: (*a*) shunt, (*b*) series, (*c*) compound, (*d*) applications.
9. D.c. motors: (*a*) shunt, (*b*) series, (*c*) compound, (*d*) applications.
10. Alternating currents: (*a*) induced e.m.f., (*b*) sine wave, (*c*) frequency, (*d*) cycle, (*e*) power-factor, (*f*) vectors.
11. Transformer: (*a*) open core, (*b*) closed cores, (*c*) turn-ratio, (*d*) types, (*e*) applications.
12. Resistance and resistors: (*a*) units-ohm, megohm, (*b*) carbon resistors — R.E.T.M.A. color code, (*c*) wire wound resistors — rheostats, potentiometers, ceramic types, (*d*) effects of wire length, (*e*) effects of wire diameter, area, (*f*) resistors in series, parallel, series-parallel.
13. Inductance and inductors: (*a*) units-henry, millihenry, microhenry, (*b*) inductors in series, parallel, (*c*) self-inductance, (*d*) mutual inductance, (*e*) iron-dust cores.
14. Capacitance and capacitors: (*a*) units — farad, microfarad, micro-microfarad, (*b*) voltage ratings — working, peak, breakdown voltage, (*c*) types — paper tubulars, oil types, electrolytic, ceramic, air.
15. Diagrams and symbols: (*a*) schematic, (*b*) block, (*c*) one-line, (*d*) installation, (*e*) pictorial.

B. *Electron Tubes*

1. Electron theory: (*a*) Structure of matter, (*b*) electron conduction through metals, (*c*) ionization, (*d*) electron beams.
2. Vacuum tube principles: (*a*) Thermionic emission, (*b*) diodes, (*c*) triodes, (*d*) tetrodes, (*e*) pentodes, (*f*) beam power tubes.
3. Electron tube constants and characteristics: (*a*) plate resistance, (*b*) plate impedance, (*c*) amplification factor, (*d*) mutual conductance (transconductance), (*e*) grid voltage plate current curves, (*f*) plate voltage plate current curves.
4. Electron tube types: (*a*) radio receiving tubes, (*b*) radio transmitting tubes, (*c*) cathode ray tubes, (*d*) phototubes, (*e*) X-ray; (*f*) ignitrons, (*g*) pliotrons, (*h*) thyratrons, (*i*) kenotrons.

C. *Radio-Frequency Equipment*

1. Oscillatory circuits: (*a*) resonance, (*b*) effects of resistance, selectivity, distributed capacity, (*c*) losses and Q of circuits, (*d*) resonance curves.
2. Power supply (rectifiers): (*a*) half wave, (*b*) full wave, (*c*) voltage multipliers.
3. Antennas: (*a*) theory of radio waves, (*b*) antennas for long waves, broadcast band, short waves, V.H.F., U.H.F., S.H.F., microwaves.
4. Demodulators (detectors): (*a*) crystal, (*b*) diode, (*c*) grid leak grid condenser.
5. Audio amplifiers: (*a*) classes A, B, C, (*b*) single, push pull types, (*c*) phase inversion, (*d*) inverse feed back, (*e*) decibel system.
6. Radio-frequency amplifiers: (*a*) tuned, (*b*) I.F. amplifiers, (*c*) wave traps.
7. Oscillators: (*a*) Hartley, (*b*) Colpitts, (*c*) tuned-plate tuned-grid, (*d*) dynatron, (*e*) crystal, (*f*) electron-coupled.
8. Superheterodyne: (*a*) theory, (*b*) block diagram, (*c*) schematic diagram, (*d*) alignment.
9. Frequency modulation: (*a*) comparison of amplitude and frequency modulations, (*b*) limiters, (*c*) discriminators, (*e*) alignment.
10. Transmitters — A.M. and F.M. (*a*) types, (*b*) principles, (*c*) block diagram, (*d*) applications.

D. *Television Equipment*

1. Receivers: (*a*) types, (*b*) principles, (*c*) block diagram, (*d*) circuit diagrams, (*e*) alignment.
2. Transmitters: (*a*) types, (*b*) principles, (*c*) block diagram, (*d*) applications.

E. *Radar Equipment*

1. Principles: (*a*) characteristics of microwaves, (*b*) cavity resonators, (*c*) wave guides, (*d*) magnatron oscillators, (*e*) klystron oscillators, (*f*) paraboloid antennas, (*g*) block diagram, (*h*) applications.

F. *Industrial Electronic Equipment*

1. Types and applications of: (*a*) resistance welders, (*b*) electrostatic precipitators, (*c*) electronic heaters, (*d*) timers, (*e*) adjustable-speed electronic drive (Thy-mo-trol), (*f*) power rectifiers, (*g*) frequency conversion, (*h*) temperature controls, (*i*) positioning control, (*j*) counters, (*k*) industrial X-ray equipment, (*l*) voltage controls, (*m*) color matching equipment.

G. *Medical Equipment*

1. Types and applications of: (*a*) electron microscope, (*b*) X-ray equipment, (*c*) electronic heaters, (*d*) electrocardiographic equipment, (*e*) medical oscilloscopes.

List of Jobs and Projects

1. Use and care of basic tools
2. Making wire connections
3. Soldering operations
4. Recognition and use of common screws, nuts, washers, and other hardware
5. Assembling a simple buzzer circuit
6. Test for conductors and insulators
7. Making series and parallel battery connections
8. Assembling a call and reply buzzer circuit
9. Magnetic field experiment and law of magnetic poles
10. Making an electromagnet
11. Producing electricity by chemical action
12. Making series and parallel connections with small bulbs
13. Continuity testing of cable
14. Producing electricity with magnetism
15. Building a low voltage transformer
16. Use of voltmeter and ammeter
17. Use of ohmmeter and R.E.T.M.A. resistor color code
18. Assembling a power line cord
19. Resistance calculation by using Ohm's law
20. Power calculation by using the power law
21. Making d.c. motor connections
22. Building a small d.c. motor
23. Making d.c. generator connections
24. Making two phase transformer connections
25. Making three phase transformer connections

26. Test for characteristics of resistors in series and in parallel
27. Test for characteristics of capacitors in series and in parallel
28. Test for characteristics of inductors in series and in parallel
29. Inductive reactance experiment
30. Capacitive reactance experiment
31. Building a simple crystal receiver
32. Building a wave meter
33. Use of tube tester and testing of radio tubes
34. Building a one tube radio receiver
35. Use of r.f. signal generator and calibration of receiver
36. Constructing a power supply
37. Use of capacity tester and testing of capacitors
38. Constructing an audio amplifier
39. Use of a.f. signal generator and testing of amplifier
40. Obtaining characteristic curves of diodes
41. Obtaining characteristic curves of triodes
42. Obtaining characteristic curves of tetrodes
43. Obtaining characteristic curves of pentodes
44. Testing frequency response and power output of audio amplifier
45. Constructing and testing a Harley oscillator
46. Constructing and aligning a five tube superheterodyne receiver
47. Use of cathode ray oscilloscope
48. Trouble shooting in a superheterodyne receiver
49. Aligning an F.M. radio receiver
50. Trouble shooting in an F.M. radio receiver
51. Testing an A.M. radio transmitter
52. Adjusting an A.M. radio transmitter
53. Trouble shooting in an A.M. radio transmitter
54. Testing a television receiver
55. Aligning a television receiver
56. Trouble shooting in a television receiver
57. Testing trigger control of thyratron tube
58. Testing phase shift grid control of thyratron tube
59. Controlling speed of d.c. motor with thyratron tube
60. Testing of saturable core reactor
61. Testing of peaking transformer
62. Constructing and testing a photoelectric tube amplifier
63. Constructing and testing an electronic timer
64. Constructing and testing a radio-controlled relay
65. Constructing and testing an inverter
66. Constructing and testing a low power induction furnace
67. Constructing and testing a small electronic spot welder
68. Constructing and testing a phototube counter
69. Constructing and testing an electronic fire alarm
70. Constructing and testing a phototube controlled thyratron
71. Constructing and testing a cold cathode tube relay circuit
72. Constructing and testing an electronic switch
73. Constructing and testing a three phase thyratron rectifier.

Evaluation of Learning

Pupils may best be evaluated by the use of test sheets and observation of their performance. Where projects are undertaken by the pupils, evaluation should be based on an appropriate amount of elemental units involved in making the project. The quality and quantity of work should also be considered.

While emphasis in industrial-arts education is on knowledge, the important basic skills and work habits should not be overlooked. The development of the proper habits of systematic planning and execution of an undertaking is extremely important, and consequently should be included in the grading of the individual.

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A RECRUITMENT PROGRAM

WILLIAM H. BOWERS

Instructor of Industrial Arts
High School
Tuckahoe, N. Y.

A number of years ago the writer had the idea that an industrial-arts career was both interesting and rewarding — a fine career for any student to follow. Until he went to work in Tuckahoe he hadn't any chance of indulging in this idea of his due to many things. At Tuckahoe he had the opportunities to work on his idea of promoting industrial-arts teaching careers for his students.

A program was organized for the industrial-arts and drafting classes concerning Oswego. Ten topics were given them for related work, one a week for a ten-week period. A series of large posters were made. These were conspicuously placed in the shop and one was placed on the school bulletin board each two weeks. This practice has continued to this date.

In 1934 one of Mr. Bowers' shop boys listened to his advice and enrolled at State Teacher's College, Oswego, N. Y. Today, 1955, this boy is principal of a school in Virginia.

The *trek* to Oswego has become quite constant since then and twenty-two boys and one girl have enrolled. Ten of these former students are teaching in this United States of ours. At the present time six boys are in Oswego studying to be future shop teachers. Seven have dropped out due to varying reasons. Dr. Gordon O. Wilbur, chief of industrial arts at Oswego, has recently said that the enrollment from Tuckahoe ranks first in New York State, according to its size.

It has taken many years to make the students conscious of this college but I think it has been worth my efforts. Today in 1955 every student in Tuckahoe High School is familiar with Oswego and its possibilities of producing an interesting life career in industrial arts. The goal of sending 25 students to this college may be reached shortly.

Problems and Projects

PROJECT DESIGN FOR TEACHERS

ALEXANDER F. BICK

Milwaukee, Wis.

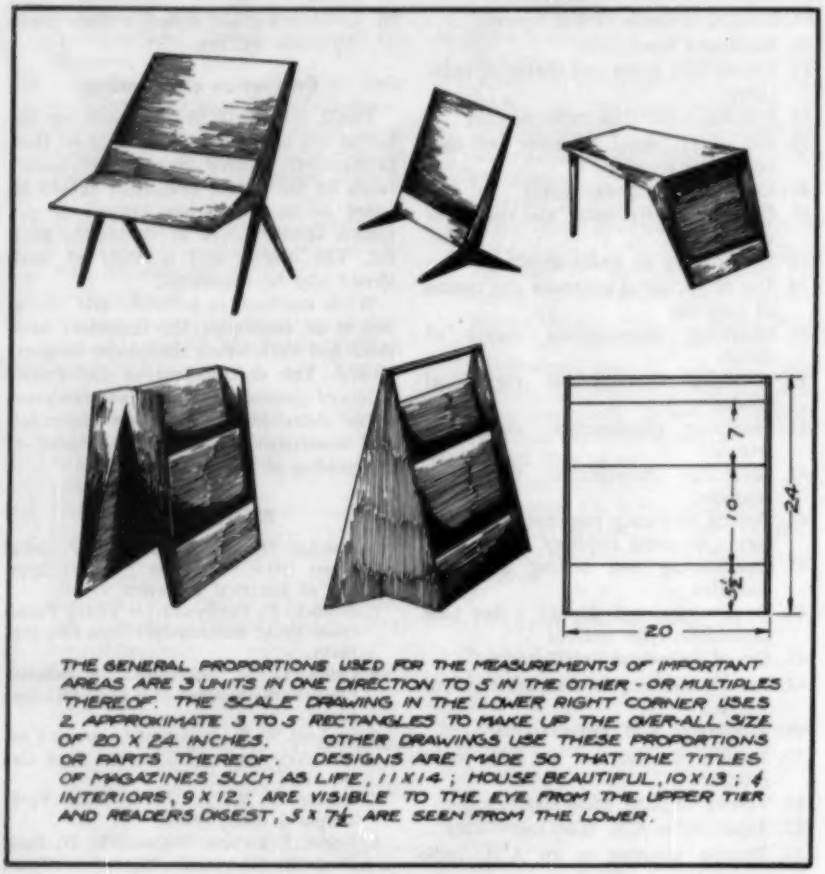
(Continued from page 319 of the November, 1954, issue)

This article, the eighth of a series, will show the design process as a bringing together and an arrangement of ideas. Design is the result of a theme idea applied to a functional idea.

A designer starts with a need, and he sketches his idea as it may best fill this need. If he designs without benefit of art, his project may be physically functional and at the same time aesthetically not appealing, or perhaps even ugly; then, in the total view it is not functional, its ugliness rendering it unfit to be lived with.

To produce a fully useful design, therefore, a designer modifies his first product, the physically functional form, to fit a timely theme, such as, "The Modern Environment," "The Contemporary Age," "The New Look," "The Air Age," or others.

In most of the articles in this series the process of design was given as a simple, two-step system, such as is given in the foregoing. The *air age* was mentioned in all articles as a symbol of our present state of mind. Art in itself is difficult to define. It refers to an aesthetic need in all highly developed humans. This need and sense is so involved in the hopes, aspirations, and hungers of a people, and in the feelings and convictions of man's inner consciousness that, when so considered, the subject of design becomes out of bounds for one struggling to understand it. Looking at the subject through the idea expressed in *air age*, understanding is eased in some degree. The *air age* symbolizes all that our age aspires to, and all it has gained thus far through art, science, and technology; and it reaches deeply into the hungers and qualities of our people. The air age is a symbol, but it is a language of symbols as well, for no age in our knowledge has accumulated so many recognizable signs as this: the airfoil form, the bat-wing shape, the light beam idea, the open space tendency, the light, transparent structure, and the off-the-ground effect in design and building: all have become more and more clearly the statement of our ideal. These forms seem to say, "We have conquered space by power, speed, and electronics; we have overcome darkness and inertia by science and engineering. We have reduced time to a fraction. We have soared at supersonic speeds and know of other speeds that tax the imagination. We have penetrated into both the boundless and the infinitesimal realms, and altogether, we have touched the periphery of a freedom never known."


7
10
5½
24
20
THE GENERAL PROPORTIONS USED FOR THE MEASUREMENTS OF IMPORTANT AREAS ARE 3 UNITS IN ONE DIRECTION TO 5 IN THE OTHER - OR MULTIPLES THEREOF. THE SCALE DRAWING IN THE LOWER RIGHT CORNER USES 2 APPROXIMATE 3 TO 5 RECTANGLES TO MAKE UP THE OVER-ALL SIZE OF 20 X 24 INCHES. OTHER DRAWINGS USE THESE PROPORTIONS OR PARTS THEREOF. DESIGNS ARE MADE SO THAT THE TITLES OF MAGAZINES SUCH AS LIFE, 11X14; HOUSE BEAUTIFUL, 10X13; & INTERIORS, 9X12; ARE VISIBLE TO THE EYE FROM THE UPPER TIER AND READERS DIGEST, 5 X 7½ ARE SEEN FROM THE LOWER.

Applying design proportions to the chosen sketch

It is true that the act of combining function with the essential sign of such an age (or any age) is an exercise of aesthetic feeling, and this is art. To express it that way is confusing, however; therefore, the articles have played with the single idea, *air age*, an understandable all-inclusive phrase.

To once more illustrate upon a specific case, we will consider the design of a periodical stand.

Magazines curl up when set vertically without support. The logical position for a magazine (notice the latest magazine dispensing racks in our new stores) is flat, either horizontally or at a readable angle in what might be called *pockets*. This, then, is our key idea: magazines lying flat at a readable tilt.

To sketch with this idea alone might produce designs as clumsy as before, and the first sketches might well be so, since a designer must first decide upon the best useful tilt and upon its support. However, it is obvious that this alone is not *design*. The first steps described are essential, however, to the end of design, but design itself is a *plus* element: it goes beyond usefulness into the composite state of usefulness plus the quality and thought of the time, or usefulness plus the theme idea, *air age*. Art reduces *quality and thought* to symbols, and of course, each individual expresses the symbol with his own concept about it. Let us take, for example, one of the air-age symbols: the the bat-wing airplane form. Let us be free with the form and use it in any variation necessary to answer the practical need.

See drawing of the bat-wing form and its variations.

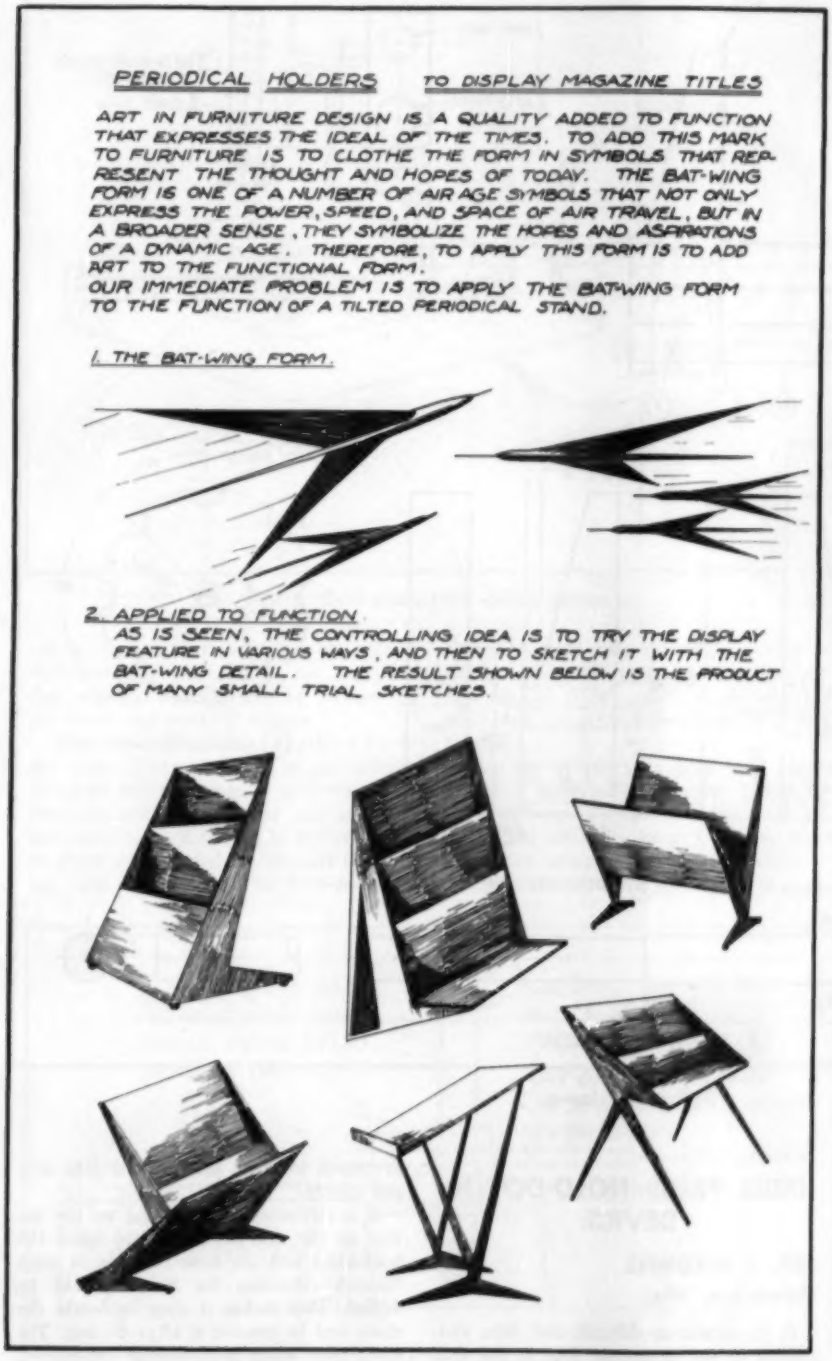
Our problem is now reduced to combining two ideas; namely:

1. A periodical stand or holder for magazines lying flat at a tilt.
2. The variation of the bat-wing symbol.

Playing with these ideas will result in designs such as are shown in the accompanying plates.

"Playing," in this instance, is an important function. Designs do not evolve with any measure of press-button simplicity. Those that earn the esteem of time and age are the fruit of work. Designing is work. Working with an idea: drawing and redrawing it, leads to new ways of expressing it. One design teacher aptly advises his students to "draw it a hundred times." This is one of the best procedures, as has been repeatedly stated in these articles. The sketches shown herewith are the final forms of ideas developed from pages of small sketches. This is what is meant by "playing" with an idea.

Try it, and you will be sure to find an amazing unused potential to which all men are heir. Sit down in a quiet corner with a soft pencil and a large block of paper. Take the two ideas given in the foregoing; and play with them. Make two or three pages of small sketches on the theme, and each time, express the "air age" more truly and clearly, compelling the form to speak the essential feeling of the age, its newness, cleanness, lightness, and freedom.


PERIODICAL HOLDERS TO DISPLAY MAGAZINE TITLES
ART IN FURNITURE DESIGN IS A QUALITY ADDED TO FUNCTION THAT EXPRESSES THE IDEAL OF THE TIMES. TO ADD THIS MARK TO FURNITURE IS TO CLOTHE THE FORM IN SYMBOLS THAT REPRESENT THE THOUGHT AND HOPES OF TODAY. THE BAT-WING FORM IS ONE OF A NUMBER OF AIR AGE SYMBOLS THAT NOT ONLY EXPRESS THE POWER, SPEED, AND SPACE OF AIR TRAVEL, BUT IN A BROADER SENSE, THEY SYMBOLIZE THE HOPES AND ASPIRATIONS OF A DYNAMIC AGE. THEREFORE, TO APPLY THIS FORM IS TO ADD ART TO THE FUNCTIONAL FORM.
OUR IMMEDIATE PROBLEM IS TO APPLY THE BAT-WING FORM TO THE FUNCTION OF A TILTED PERIODICAL STAND.
1. THE BAT-WING FORM.
2. APPLIED TO FUNCTION
AS IS SEEN, THE CONTROLLING IDEA IS TO TRY THE DISPLAY FEATURE IN VARIOUS WAYS, AND THEN TO SKETCH IT WITH THE BAT-WING DETAIL. THE RESULT SHOWN BELOW IS THE PRODUCT OF MANY SMALL TRIAL SKETCHES.

Designing a periodical holder

DRILL PRESS CLAMP

CLINTON HILLYARD
Howard Roosa School
Evansville, Ind.

One of the most comforting things when using a drill press is to know that your work is securely fastened, and the drilling can be done with safety. The clamp described herewith is a necessity in the elementary school shop. Needing such a clamp, and not being able to find anything like what was wanted on the market, it was designed for use in our school shop.

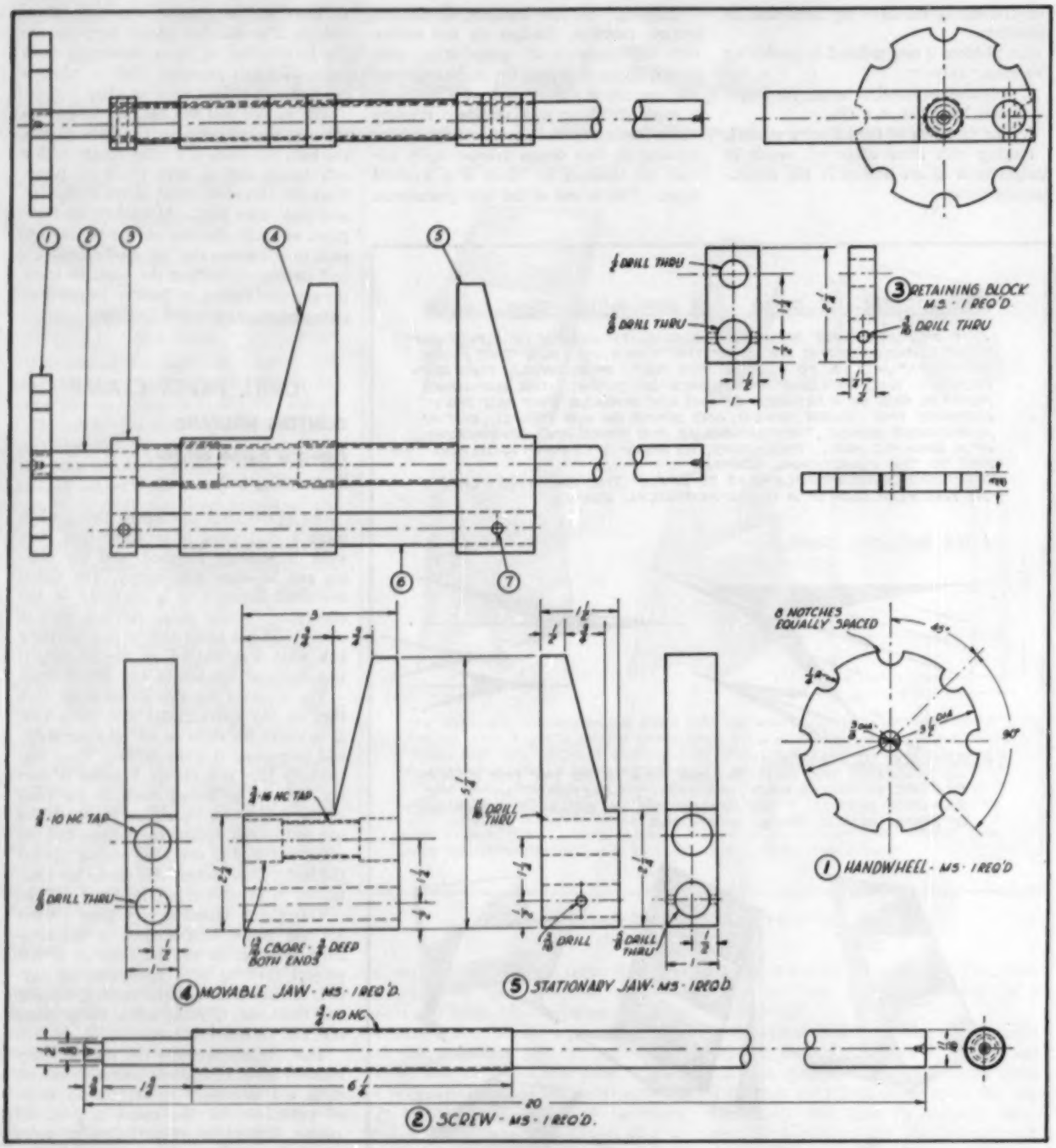
The students use this clamp more than they do the conventional drill press vise. It is easier for them to set up their work, and to manage it while drilling. They particularly like this clamp, because it does not have to be bolted down to the table of the drill press. Provisions are made for one end to rest against the column and the other end held in one hand resting against the body. Don't forget this clamp has limitations as to what it will hold and will do.

This clamp makes a very good project for the senior high student in machine-shop practice. It can be used as a test project covering such operations as: layout, sawing, drilling, lathe turning, tapping and threading, aligning holes, filing, riveting, and surface grinding.

This project requires the use of many tools to make component parts; therefore, it is not necessary to set up an order of procedure for the entire project. Of course, it is necessary to follow an order of procedure in making the part. The parts should be checked periodically as to fit and alignment.

BILL OF MATERIAL AND PARTS

Quan.	*Name*	*Material*	*Size*
1	Movable jaw	Mild steel	1 x 3 x 5¼
1	Stationary jaw	Mild steel	1 x 1½ x 5¼
1	Screw	Mild steel	¾ x 20
1	Guide pin	Mild steel	⅝ x 8¼
1	Handwheel	Mild steel	⅜ x 3½ D
1	Retaining block	Mild steel	1 x 1½ x 2¼
2	Dowel pins	Mild steel	5/16 x 1


3 RETAINING BLOCK · MS · 1 REQ'D
8 NOTCHES EQUALLY SPACED
1 HANDWHEEL · MS · 1 REQ'D
4 MOVABLE JAW · MS · 1 REQ'D.
5 STATIONARY JAW · MS · 1 REQ'D
2 SCREW · MS · 1 REQ'D.

Drill press clamp

NOTE: The handwheel is riveted in place. To secure wheel more firmly, take a file and file a notch on the inside outer corner of the hole before riveting. Then when riveting is done the notch will fill with metal and make the wheel more secure.

The dowel pins should be swelled on both ends to make them fit very tightly in the holes, then filed until smooth.

DRILL PRESS HOLD-DOWN DEVICE

JOS. J. LUKOWITZ
Milwaukee, Wis.

It is sometimes difficult and time consuming to set up certain jobs in the drill press vise. In Figure 1 is shown a device developed to make such drilling jobs safe and speedy.

It is advisable when setting up the device on the drill-press table to space the hold-down and the base to allow at least 1/16-inch clearance for the stock to be drilled. This makes it easy to locate the stock and to remove it after drilling. The slight burr which is formed on the bottom when the hole is drilled will make it diffi-

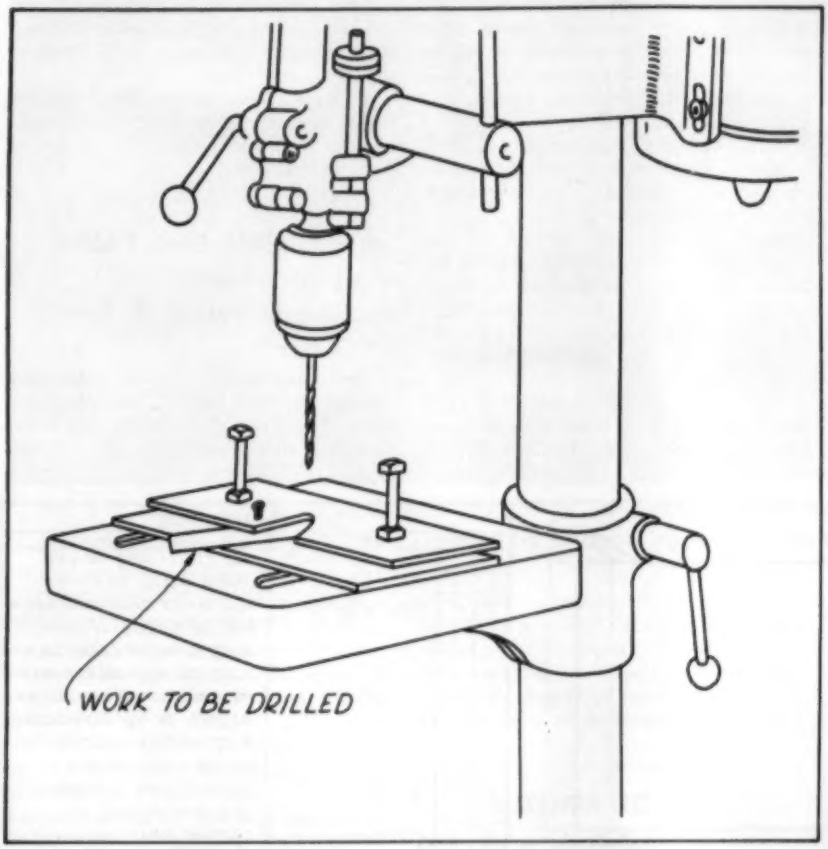


Fig. 1. Drill-press hold-down device

cult to remove the stock when the hole is drilled if this clearance is not provided. Any required spacing may be secured by the use of one or more washers.

Often the hole in the drill-press table is too large. Make the hole in the drilling device to suit the range of your work. Dimensions are not given as any stock at hand may be used so long as the principles involved are provided for. Be sure to make the base wider than the hold-down as shown. A wide base makes it possible to quickly slide the work into position and line up the center punch mark with the drill. Any convenient length of bolt may be used.

The use of pliers to hold work to be drilled is hazardous. When the drill is being withdrawn it often pulls the work up, grabs, and spins the work with great danger to the operator and others nearby.

The safety element, the saving of time, and the elimination of bottlenecks makes the device very much worth the small amount of time required to construct it.

If you have never had the type of accident referred to remember the potential is there — prevent the first one!

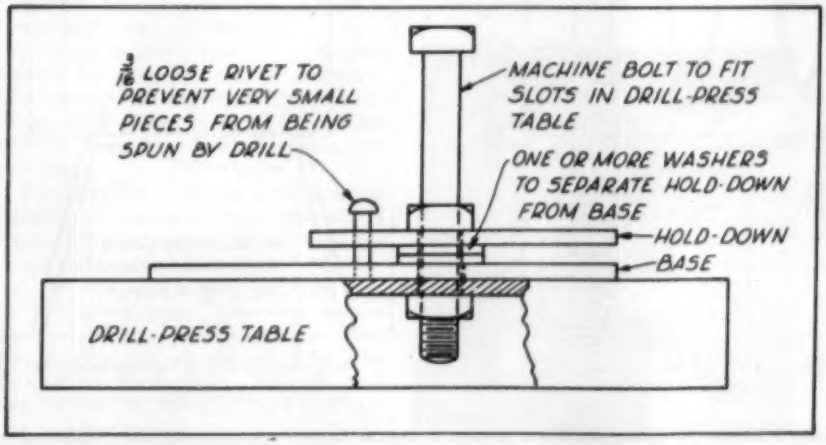

LOOSE RIVET TO PREVENT VERY SMALL PIECES FROM BEING SPUN BY DRILL
MACHINE BOLT TO FIT SLOTS IN DRILL-PRESS TABLE
ONE OR MORE WASHERS TO SEPARATE HOLD-DOWN FROM BASE
HOLD-DOWN
BASE
DRILL-PRESS TABLE

Fig. 2. Details of drill-press hold-down device

REMOVING DENTS IN WOOD

Student woodworking projects often become dented during storage. To remove the dent, place a wet pad of cloth over it and apply a heated soldering copper. The steam will raise the dent. Sand and the job is as good as new. — *Ralph Steeb, president, The Industrial Arts Association of Pennsylvania, Allegheny County Branch.*

BROOM STORAGE

C. WAYNE CLOSE
Glendale, Ore.

If your shop classes do the regular cleanup, storage of push brooms is no doubt a problem. We store our brooms on a rack high on the wall. Thus they take up no usable space, are out from underfoot and the brushes last longer than when stored on the floor.

Broom storage rack

NEWS FROM THE STOUT INSTITUTE

As of July 1, 1955, Stout Institute Menomonie, Wis., is officially designated Stout State College. Formerly under the jurisdiction of the Board of Trustees of

Stout Institute, the college is now transferred to the authority of the Board of Regents of Wisconsin State Colleges.

The change came about when Stout and the Wisconsin Institute of Technology at Platteville were integrated with Wisconsin's other state colleges under one board of regents.

Two administrative appointments at Stout have also been announced by Dr. Verne C. Fryklund, college president. Frank J. Belisle, well-known Wisconsin schoolman, has been named registrar, following the retirement of Miss Gertrude M. O'Brien. Appointed director of library has been Miss Phyllis Bentley, succeeding Miss Lillian Froggatt, who also retired.

Frank Belisle comes to Stout State College after 13 years as teacher of biology at Menomonie high school. He earned a master's degree from the University of Minnesota and a bachelor's degree from River Falls State College. Prior to joining the faculty of Menomonie high school, Mr. Belisle held principalships at Nelson, Augusta, and Woodville, Wis.

At Stout State College, Belisle will serve as placement chairman, as well as registrar. He also holds membership on the Dunn County School Committee.

Phyllis Bentley, new director of the library, has her master's degree from the School of Library Science of Columbia University and a bachelor's degree from the University of Wisconsin, where she had preparation in the University Library School.

Her experience includes appointments as assistant librarian at Beloit College, Mankato (Minnesota) State Teachers College, and the Free Library at Burlington, Iowa. She was also chosen to be guest librarian at St. Cloud (Minnesota) State Teachers College.

At Stout State College, Miss Bentley will be in charge of the new college library, recently built and opened for the use of students and staff.

MODERN END TABLE

E. MILTON GRASSELL

Designed by WILLARD K. MARTIN
Corvallis, Ore.

The chrome tubing, dyed clothesline rope, wrought-iron legs, and the massive woodwork all contribute in making this a distinctively styled end table. And further,

BILL OF MATERIAL

NO.	PCS.	PART	SPECIFICATIONS
1	1	TOP 1 3/8 x 12 x 27	USE WHITE PINE OR ANY
2	1	BACK 1 3/8 x 12 x 12	OTHER WOOD. TO FINISH
3	1	SHELF 1 3/8 x 12 x 27	RUB WHITE PAINT INTO GRAIN.
			RUB OFF EXCESS, LET DRY; SAND & FINISH CLEAR LACQUER OR WAX. PARTS MAY BE BUILT UP OF TWO THICKNESSES OF 3/4" PLYWOOD & FACED ON ALL EDGES. MITER ALL CORNERS.
4	1	1/4 ROPE	CLOTHESLINE SUITABLE. DYE ANY COLOR.
5	1	1" TUBING	CHROME, BRASS OR COPPER. SET IN 1/4 RECESS BEFORE STRINGING.
6		LEG FRAME	1/2 CRS - DRILL HOLES & MOUNT WITH SCREWS TO BOTTOM OF TABLE.
7	9	SCREW EYES	USE SIZE LARGE ENOUGH TO ACCOMMODATE ROPE.

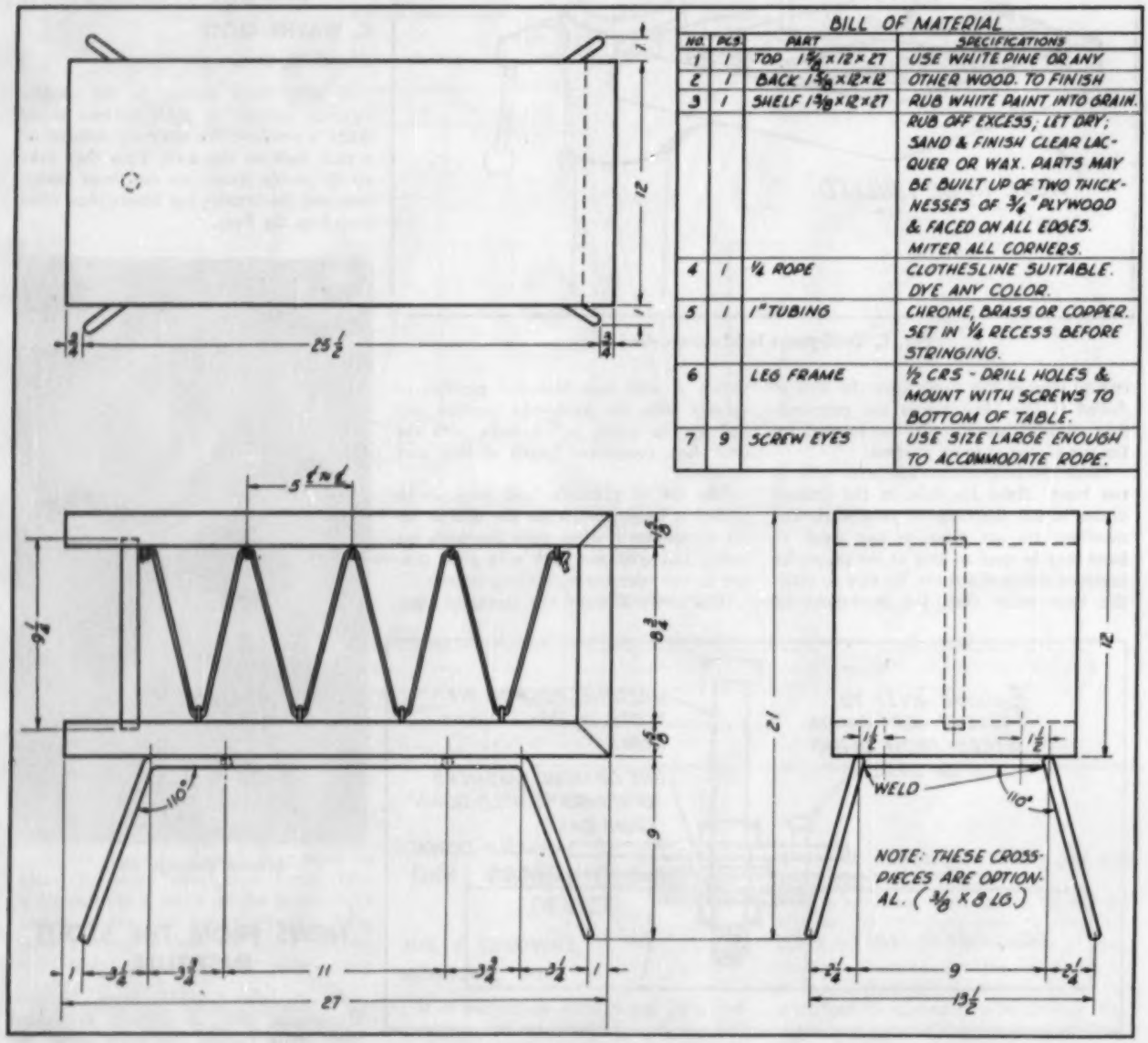


Fig. 1. Details of the modern end table

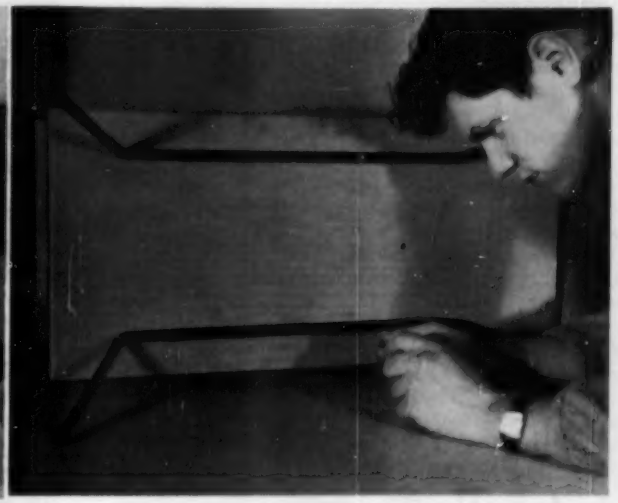


Fig. 2. Ordinary clothesline rope, dyed to match or harmonize with the central color in your room, is strung up and down for an unusual effect. (At right) Fig. 3. Metal leg units are fastened to the woodwork with screws

this unusual large array of different building materials actually simplifies the construction of this unique project. In fact, with the exception of applying the finish, it could be easily considered a one evening project.

White pine, 1⅝ in. thick was used for the woodwork; however you can use any other material. For instance, two pieces of ¾-in. plywood can be glued together to give the woodwork a massive depth. If plywood is used, all of the edges should be faced with ⅛ by 1½-in. strips that are glued and nailed with 4*d*. finish nails.

All joints in the woodwork are mitered, glued, and nailed with 8*d*. finish nails.

The 1-in. diameter tubing (chrome, brass, copper, or aluminum) was set in ¼-in. deep recesses in both the top and bottom panels. Next, place five screw eyes (large enough for the ¼-in. cord) on 5-in. centers underneath the top panel and four more on the top side of the bottom panel. The decorative *partition* cord is ¼-in. diameter clothesline rope that was dyed with ordinary household dyes. This cord can be dyed to almost any color you desire.

Purchase ordinary cold roll mild steel for the leg work. Heat is not necessary; the legs can be bent *cold*. Drill several 5/16-in. holes so the legs can be mounted with No. 8 by 1-in. r.h. screws to the bottom panel.

The modern finish on the woodwork was achieved by rubbing on white paint with a rag and after a few minutes wiping off the excess paint with a clean cloth. After drying, the surface was rubbed lightly with No. 8/0 garnet paper. Then clear lacquer was sprayed on (clear varnish or even just a plain coat of wax could be substituted for the lacquer). However, wax will not give the luster obtained with lacquer or clear varnish.

Clean the metal legs thoroughly with steel wool to remove all oil and grease, then apply a coat of dark gray automotive primer or flat black paint. To insure against floor scratches from the metal legs, purchase four crutch tips from the dime store and slip one over the bottom of each leg.

AUTOMATIC DRIFT

EDWARD G. SENKEWITZ
South Vocational High School
Pittsburgh, Pa.

The automatic drift described herein is a project which can readily be reserved for that extra good boy. It requires close workmanship, a good insight into mechanics, and the ability to work alone.

There are a few places where mistakes can be made. If, for instance, the boy drills the pilot or tap hole through the cap, and the screw clearance hole through the handle separately, there is a good chance for him to make an error in aligning the holes. Should he be careless in drilling the pilot hole for the drift and the drill goes into the handle eccentric, then he is sure to have a job which will not work smoothly and efficiently. The drift piston and cylinder must be true and without burrs.

Using the automatic drift

The operations mentioned are the only ones requiring special care. A boy with fair ability and sufficient experience can easily produce an automatic drift to his own satisfaction and that of the instructor.

Method of Procedure — The Body

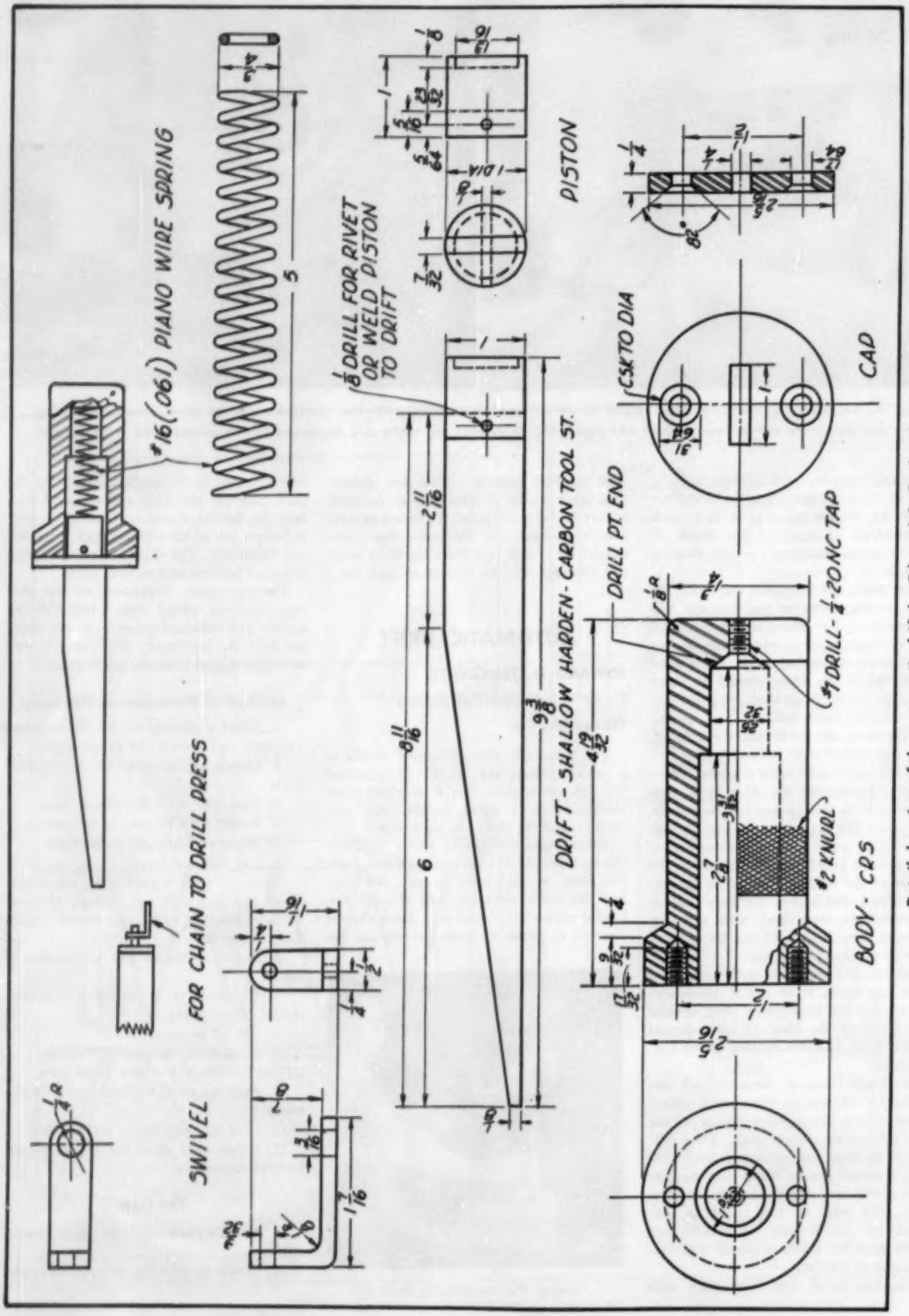
1. Select a piece of 2½ by 5⅝-in. round c.r. steel, and file off the rough edges.
2. Chuck up allowing 4¾ in. to protrude.
3. Face and drill the center hole.
4. Rough turn to outside diameters.
5. Dress tool bit and finish turn.
6. Lay out and knurl.

NOTE: To get a good knurl use a slow speed and fast feed, fast enough to cover width of knurling tool marks in one revolution of spindle.

7. Drill the 25/32-in. hole to the desired depth.
8. Counterbore 1 diameter. Cylinder should be relatively smooth.
9. Cut off to size.
10. Place large diameter into chuck, protecting the finished surface from jaws.
11. Face the small end and round off the edges.
12. Drill and tap swivel screw hole.
13. Polish only after the cap has been fastened into place.

The Cap

1. Select a piece of 2½ by 1¼ c.r. round steel.
2. Chuck up allowing ½ in. to protrude.
3. Face.



Detail drawing of the automatic drift by Edward G. Senkewitz

4. Turn down to correct diameter and file off all rough edges.
5. Cut off and trim rough face.
6. Lay out slotting hole.
7. Lay out fastening holes.
8. Drill holes for machining the slot, and countersink fastening holes.
9. Break webs between holes with a slotting chisel.
10. File edges. Polish slot.
11. Clamp cap to body. Using 17/64 spot drill pilot holes. Replace 17/64 drill with No. 7 drill. Drill pilot holes in body.
12. Clean holes, remove clamps, and tap for ¼-20 or machine screw. Do not drill fastening holes. Then after clamping and aligning cap to body, drill No. 7 pilot holes through cap into body.

Mark body and cap to identify positions of each. Remove clamps. Clear cap fastening holes with 17/64 drill and countersink. Tap pilot holes in body.

13. Fasten cap to body and polish.

Swivel

1. Select a piece of 5/16 by ½ by 2½ c.r. steel.
2. File rough edges.
3. Lay out and drill holes.
4. Lay out and bend to shape.
5. File and polish.

Piston

1. Select a piece of 1¼ by 2-in. round c.r. steel.
2. Chuck up allowing 1¼ in. to protrude.
3. Turn down to 1.000–.005.
4. Bore face 5/32 deep by 15/16 diameter; face end so that bore is ⅛ in. deep.
5. Cut off and file edges.
6. Lay out slot.
7. Slot piston 5/16 deep by 7/32 wide.

Drift

1. Select a piece of 1042 stock approximately ¾ by 1 by 8 9/16 in.
2. Shape one surface so that the thickness equals the width of the slot.
3. Lay out, and shape the angle.
4. File the drive edge round.
5. Fit into piston checking alignments.
6. Lay out drill and countersink rivet hole.
7. Center punch to identify parts.
8. Pull drift out of piston.
9. Harden and temper. Endeavor to keep drive edges of drift brighter than center. Since there is a good possibility of the drift warping, heat and boil a little kasenit into its surface before continuing the hardening and tempering operations.
10. Polish.
11. Assemble drift and piston, riveting together. File sharp edges off rivet.

Spring

1. The spring can be made out of any gauge piano wire from .042 to .078 diameter. It should be light enough to compress to 1 3/32 easily, yet strong enough to throw piston 1⅞ in. It is important that the spring be made to fit 2 3/32 hole without too much play.
2. Drill ⅛ hole ¼ in. from end of ⅝ diameter by 6-in. bar.
3. Chuck up with hole at tailstock end of lathe. Allow 5½ in. of bar to protrude.
4. Fasten wire through hole. Set lathe to chase four threads per inch.
5. Wind wire once around toolpost to produce a drag. Set chuck in slowest power motion or turn with left hand holding wire taut with right hand. Wind wire over length of bar. Fit and cut to desired length.

Assembly

1. Remove cap from body.
2. Insert and fit spring, oil.
3. Test movement of piston and drift.
4. Refit cap noting and checking looseness in drift movement. Check for binding.
5. Fasten swivel.
6. Inspect for rough edges, unnecessary file marks, etc.

UTILITY TOOL CARRIER

BEN LONGO
General Metals Instructor
and
CONRAD MAYER
Machine Shop Instructor
Stratford High School
Stratford, Conn.

Instructors of general metals who are interested in developing new projects will find the utility tool carrier useful and educational. This tool carrier is used to carry tools and materials for odd jobs around the home and in industry. It is attractive, light, durable, and inexpensive.

The learning units include instruction in the metalworking areas of sheet metal, welding, and forging. The student has the experience of working with different types of materials. Skills will be developed in the use of sheet-metal tools and machines, welding equipment, and forging equipment.

The average student will complete the tool carrier in about ten hours of shopwork. The size of the project with its many operations holds the interest of the student. This tool carrier has been made successfully by beginners in general metals classes at the Stratford High School during the past several years.

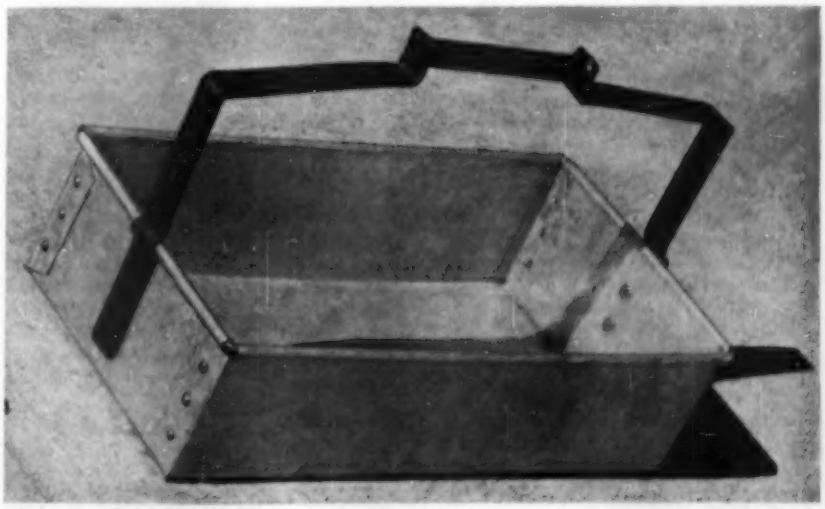
It was found that a template greatly increased the accuracy of the bends for the straps. The carrier may be finished by painting the handle flat black. Another desirable finish is to apply a "Wrinkle Finish" on the outside of the entire project.

BILL OF MATERIALS

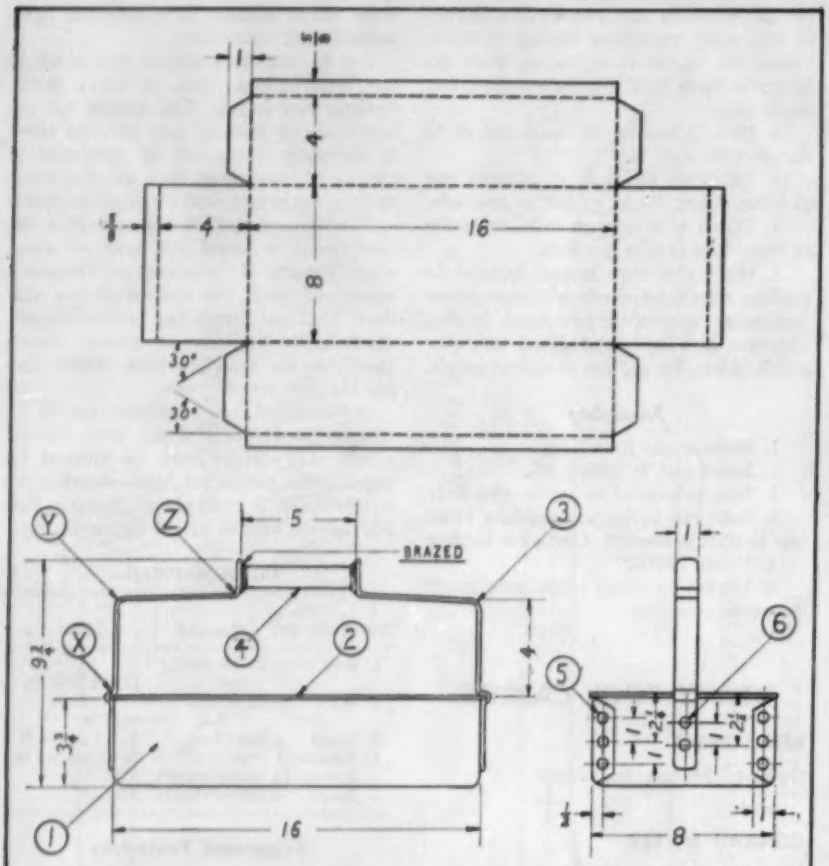
No.	*Name*	*No. of Pcs.*	*Material*	*Size*
1.	Box	1	24-ga. galv. iron	17¼ x 25¼ in.
2.	Wire	1	¼-in. dia. C.R.S.	49⅜ in.
3.	Strap	2	band iron	⅛ x 1 x 14½ in
4.	Handle	1	pipe	⅜ in. o.d. x 5 in.
5.	Rivets	12	tinner's rivets	2 lb.
6.	Rivets	4	tinner's rivets	5 lb.

Suggested Procedure

A. *Sheet-Metal Box*
1. Select stock.
2. Make layout.
3. Have instructor check layout.
4. Cut out stock.
5. Drill or punch holes in end flaps.
6. Bend for wire edge.
7. Bend sides of box.
8. Fold over the end flaps.



Sheet-metal utility tool carrier



NO.	NAME	MATERAL	SIZE
6	RIVETS	4 TINNER'S RIVETS	#5
5	RIVETS	12 TINNER'S RIVETS	#2
4	HANDLE	1 PIECE PIPE	⅜ O.D. × 5"
3	STRAP	2 PIECES BAND IRON	⅛ × 1 × 14⅛
2	WIRE	1 PIECE ¼" C.R.S.	49⅜
1	BOX	1 PIECE 24 GA. GALV. IRON	17¼ × 25¼

Details of the sheet-metal tool carrier

9. Locate and drill holes underneath flaps.
10. Rivet flaps.
11. Wire edges.
12. Solder corner joints.

B. *Wrought Iron Strap*

1. Select stock.
2. Make layout.
3. Cut to length.
4. Center punch location of bend.
5. Form curve (x) to fit over wire edge.

NOTE. This bend can be made hot or cold. The jaws of a vise will be set to about ⅝ in. apart. Line up center punch marks over the jaws of vise. Hammer a hardened ⅝-in. rod into the vise openings so that the curve will fit over wire edge.

6. Drill holes.
7. Form bend (y).
8. Form bend (z).

C. *Braze Handle*

1. Select stock.
2. Cut to length.
3. Braze handle to straps.

D. *Assembly*

1. Position curve (x) of strap over wire edge.
2. Locate and drill holes.
3. Rivet straps to box.
4. Check for straightness.
5. Apply desired finish.

COPPER ENAMELING

GRETCHEN GRIMM
and
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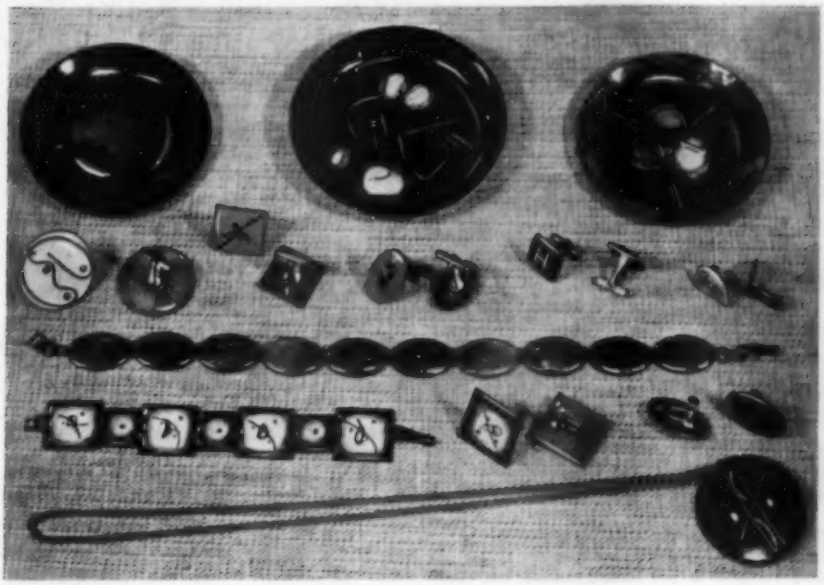
Eau Claire, Wis.

A most interesting project is that of enameling on copper. This craft was popular many years before the birth of Christ and many extremely interesting styles of jewelry were made at that time. At the present time, this craft has become a hobby for young and old alike and we find children as young as ten years old doing this work quite skillfully. Although the process has its rules, regulations, possibilities, and limitations, it seems to be one which presents many creative opportunities. There seems to be no end to new discoveries, new techniques and new designs. Also, we find a variety of new media being added which give variety, interest, and constantly new exciting developments.

Basically the process is simple for it consists of the fusing or baking of glass onto copper at a temperature of at least 1300 deg. F. The usual project is produced by carrying out the following steps. The base for the piece of jewelry or ash tray is 18-ga. copper. Shapes — square, round, oval, etc. — can be purchased, or the creator may cut his own shapes with a tin shears. The copper is thoroughly scrubbed with a cleanser, washed, and wiped dry. Do not touch the surface of the copper after it has been cleaned. Then lay it on a clean piece of paper. Apply oil to this clean dry surface. This is a thin oil that accompanies the enameling kit or can be purchased at a craft supply store. The copper may also be covered with agar, but this, at times, has a tendency to *creep* from the edges making an even design difficult. If the copper is thoroughly clean, the oil should not *creep*. Next, dust powdered glass of desired color over the entire top surface.

The dusting consists of shaking the powdered glass through some fine screen such as a very fine pepper shaker. One very good type of shaker can be made by putting a nylon stocking over the top of a small jar or bottle. The layer of powdered glass should be quite thick so that no copper shows through. This can be fired immediately and design applied later or the design may be applied on the powder at this time. If the design is applied later, more than one firing process is necessary. Either method may be satisfactory depending on the desires of the artist after he has done some experimenting. If the powdered glass is put on too thickly, it may crack when the heat is applied. If it is too thin, the copper will show through and an undesirable dark area will exist. Again, experimentation is necessary. Many enamel specialists have said that one successful piece out of 20 is a good average. In our experience, we have discovered that failures are almost negligible. Even fifth graders create striking and successful pieces the very first time.

Now, concerning the design of these articles. The plain covering of enamel alone calls for design. Larger chunks of glass and glass threads may be used to design the object. Recently we have found how very attractive copper jewelry wire can be in these designs. When this is ap-



Enameled copper projects

plied it must be rather securely embedded into the powdered glass before the first firing as this metal does not melt at this temperature. When the desired design is completed the piece is ready for firing. By using a small spatula, lift the copper unit into a kiln which has been preheated to at least 1300 deg. F. Many enamel kilns are now on the market ranging in price from $6.98 on up. The piece stays in this heat for approximately 3 minutes. All of the enameling kilns have arrangements for viewing the object during firing through an opening. After a few minutes it will appear to be smooth and shiny, at which time it should be removed by slipping the spatula under it. Beware of overfiring as this causes blackened edges, bubbles, and burnt colors. Be sure to place this very hot object on a piece of asbestos board. Allow it to cool. If you are working with a very large kiln, bear in mind that a long handled spatula and protective gloves will be necessary to protect the worker against the intense heat. With the small kiln this is not necessary.

During the cooling process you will notice that the colors which appeared to be dark in the intense heat will regain their true color as they cool.

If, when cooled, the piece is according to your liking, you are ready for the finishing stages. If you are not satisfied with your design, changes may be made and the piece refired. The finishing consists of cleaning the back and the edges with abrasive paper and a file until the back is a clean, pinkish copper color. If copper jewelry wire has been used, a certain amount of filing is necessary here also. You may preserve a rounded effect or file the wire down so that it has a flat surface.

If soldering for pin back, earring, or cuff link back is necessary, this process should come next. You may solder according to your own rules or with some of the small kilns, soldering may be affected right on the top of the kiln. After soldering, the piece will again have to be polished. Use abrasive paper again and finish with steel wool, metal polish, or ordinary kitchen cleanser. Spray the exposed copper parts with a plastic spray or a coat of clear nail polish.

As mentioned, this copper may be cut into interesting shapes by use of metal cutting shears. Square shapes are easily cut on the jig saw using a metal cutting blade. Holes can be drilled in this copper (for bracelet links, medallions, and necklaces) with a hand or electric drill.

For interesting designs, consider these possibilities. Glass chunks and glass threads as well as copper jewelry wire have already been mentioned. Often old glass jewelry pieces can be crushed and applied. Tiny scraps of copper offer variation in design. Several colors of the powdered glass may be applied simply by the use of a stencil. Powdered glass can be applied to agar to form a liquid state which is easily applied with a small brush or a pen. Many craft shops now handle liquid enamels which are easy to apply like paint.

Because of the tremendous interest in enameling, you will find that most craft shops carry a good supply of necessary equipment. It is gratifying also to note that this is not an expensive hobby. It is both practical and decorative, and finally, it is a very gratifying past time.

Crayfish grow new eyes if their old ones are destroyed, but, largely through lack of care, Americans have five million unseeing eyes. — *American Optometric Association.*

HOW TO BUILD THE SANDRA LEE II

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Industrial Arts Instructor
Portland, Ore.

This sailboat is an easily made, reliable model that has won many races in recent years. The design has been slightly changed from the original "Sandra Lee" to give a more streamlined appearance and greater speed. The plans are now adapted to 18-, 24-, 30-, and 36-in. lengths, which include the four principal classes in our annual regatta.

Steps in Construction

1. Make a careful working drawing of the Sandra Lee II.
2. Square up a block of pine to:
   18-in. model — 2 by 4¾ by 18 in.
   24-in. model — 2¾ by 6 by 24 in.
   30-in. model — 3½ by 7 by 30 in.
   36-in. model — 4 by 8 by 36 in.

This will usually involve sawing out pieces to a rough size, planing the flat surfaces, and gluing up the stock with waterproof glue before squaring.

3. Draw a center line with a marking gauge completely around the block and square pencil lines around the block as shown below:
4. Lay out lines A and B.
5. With a ripsaw and a jack plane, saw and plane to lines A and B. Replace the center line.
6. Trace the deck pattern on the top of the block. This pattern is of one side only so line the pattern up carefully with the center line. Your instructor will provide a pattern.
7. With a ripsaw and jack plane, plane to the deck line. Keep the sides square with the deck.
8. Construct the keel:
   a) Square up a block of pine to the following dimensions:
   18-in. model—⅝ by 3½ by 10 in.
   24-in. model—¾ by 4½ by 13 in.
   30-in. model—¾ by 5¼ by 16½ in.
   36-in. model—¾ by 6 by 20 in.
   b) Gauge a center line around the edge of the block.
   c) Locate and drill dowel holes, 2 in the 18- and 23-in. models, and 3 in the 30- and 36-in. models. CAUTION: dowel holes should be located at the center and back of the center; dowels placed toward the front will probably be cut later as the keel is shaped and will weaken the leading edge.
   d) Cut dowels to length, point slightly with pencil sharpener and glue in place. Drive dowels into keel first. Clamp with a large hand screw clamp, and check for squareness with the hull.

The three seventh grade 1954 regatta winners are: Harvey Stines, Fred Wood, and Bob Lemmon. Lawrence Lovegren, instructor
— Photograph, courtesy of Oregon Journal, Portland, Ore.

e) Cut a holding block approximately 2 by 2 by 6 in., and screw securely to the deck of the hull.

f) Study your drawing and sketch in shape of the keel. Have your instructor check.

g) With the holding block in the vise, saw out the keel with a coping saw. Smooth to the line with a spokeshave.

h) Draw a center line down the leading edge of the keel; finger gauging with a pencil is sufficiently accurate. Also draw two lines down the back edge, and two more on each side as shown in the sketch below.

i) Clamping the holding block in the vise so that the boat is lying flat, if possible, gouge four tapered grooves running from S to F. The grooves should leave the keel full thickness at S, a sharp point at F^1, and ⅛ full thickness at F^2.

j) With a jack plane chamfer the keel down to bottom of the grooves just gouged.

k) Smooth with file and sandpaper.

l) Draw the lead line at the base of the keel. Check with your instructor.

m) Saw off the portion to be replaced with lead using a backsaw.

n) Mold the pattern in sand and cast as follows:

1. Temper molding sand.
2. Place flask on bottom board and center pattern, flat side down. NOTE: Pattern should have a hole in the center for a draw screw.
3. Riddle fine sand over pattern.
4. Fill flask by hand.
5. Ram mold with bench rammer.
6. Strike off even with top of flask.
7. Place follow board on top of flask and turn mold over.
8. Uncover and firm the sand with the fingers around the pattern.
9. Swab the edges of the mold with a small brush and water.
10. Insert wood screw or draw pin in the pattern.
11. Rap in all directions with a screw driver to loosen the pattern.
12. Carefully draw out the pattern.
13. Place 20*d*. common nails in the mold to make holes for screws; use 2 in the 18-in. model; all others should have 3.
14. Place a 4*d*. finish nail in the narrow leading edge of the mold. It will then look about like the open-faced mold sketched below.
15. Pour molten lead from a ladle directly into the mold. Allow to solidify and shrink and add a little more lead.
16. Remove from the sand with pliers and cool in water.

o) Remove the nails from the casting and plane the lead and wood keel smooth to make a perfect joint.

p) Use No. 9 f.h.b. wood screws of a length to hold securely, countersink the lead for them, coat the joint with a waterproof cement and screw and nail the lead in place.

q) With a jack plane, file and abrasive paper, smooth the lead to make a perfect joint between lead and wood.

9. Gouge a groove in the hull on each side of the keel. This groove tapers from nothing at the center to about ⅜ in. deep at each end, possibly a little deeper for 30- and 36-in. hulls. See sketch in Figure 4.

10. Lay out the first chamfer. This is done by marking 3 points — one at the bow, one at the stern, and one in the middle, or at the beam, one-third of the way to the deck as shown in Figure 4. Bend a ¼-in. dowel around the hull at these points and mark your first chamfer line. Two boys should work together on this layout.

11. With a jack plane, plane to the line from the center line of the hull at each end and to the bottom of the groove. The boat will now look like Figure 5.

12. Lay out second chamfer. This is sketched in freehand as shown above and is ⅓ of the way from the chine line or sharp corner obtained in the last step to the center line and to the deck line. Check these 4 lines with your teacher.

13. Plane the second chamfer. The boat will now look as shown in Figure 6.

14. Plane the third chamfer. This consists merely of rounding off the corners marked xx in Figure 6. Fare the ends of the keel in smoothly with the hull.

15. Sand with No. 1 or No. ½ garnet paper until all chamfer corners are thoroughly rounded. It is well to sand across the grain.

16. Finish with 1/0 and then 2/0 garnet paper going with the grain of the wood.

17. Check by sighting each end to see that both sides are accurate. Have instructor check you at this point.

NOTE: If the hull is perfectly streamlined one may bend a 3/16-in. dowel around it from stem to stern and it will cling to it without showing open spaces. Flat spots on your boat will cause eddys which tend to slow the boat.

18. Remove the holding block and make a cradle out of scrap lumber for holding the boat in a vise as shown in Figure 7.

19. Finger gauge a line ¼ in. from the deck line of the boat and gouge out the hull to ¼-in. wall thickness.

Suggestions:

a) Wear a glove or pad the end of the gouge handle.

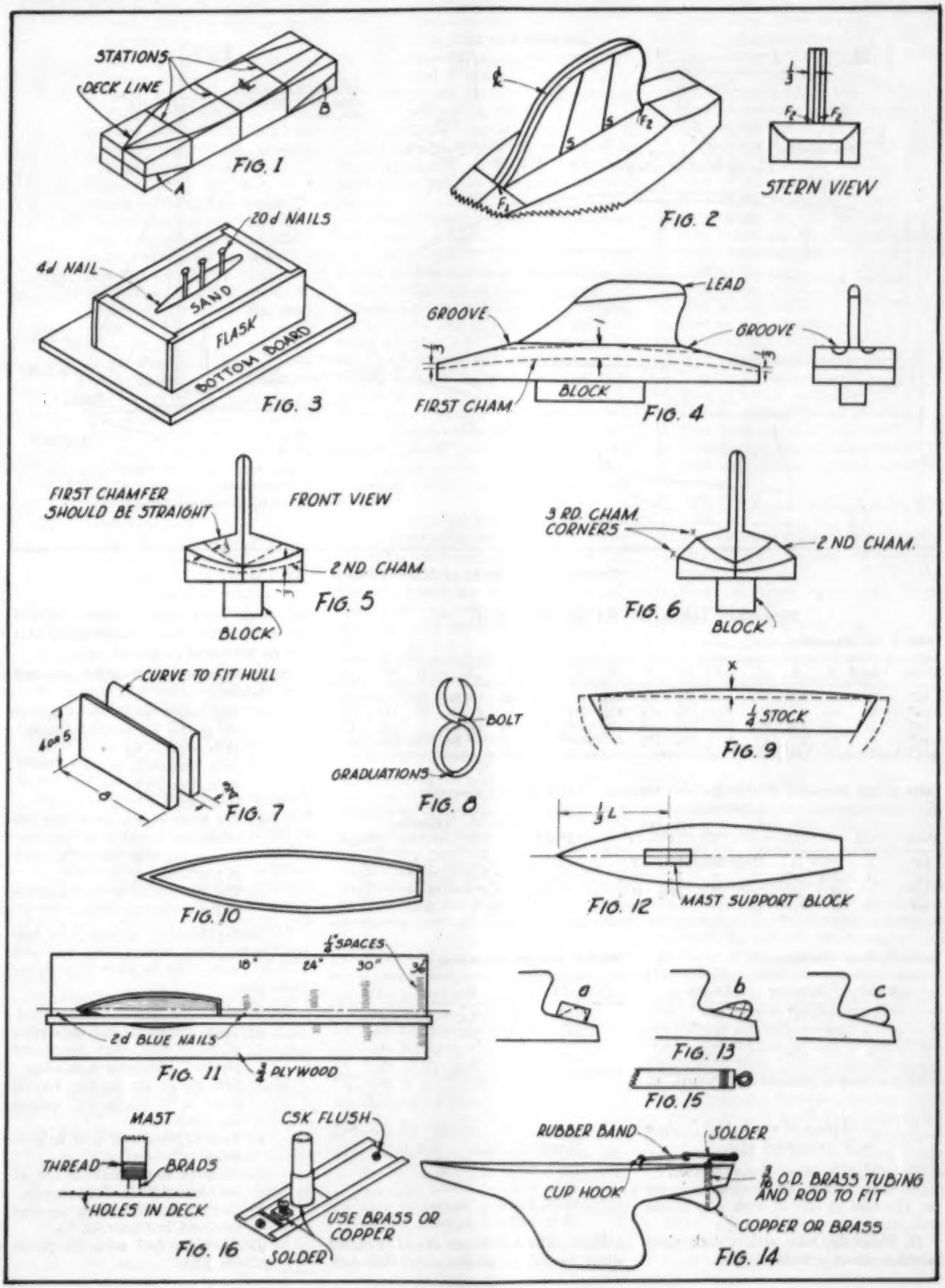
b) Use an outside bevel gouge, ¾ in., preferred, sharpened and buffed to a razor edge.

c) Always keep both hands on the handle of the gouge.

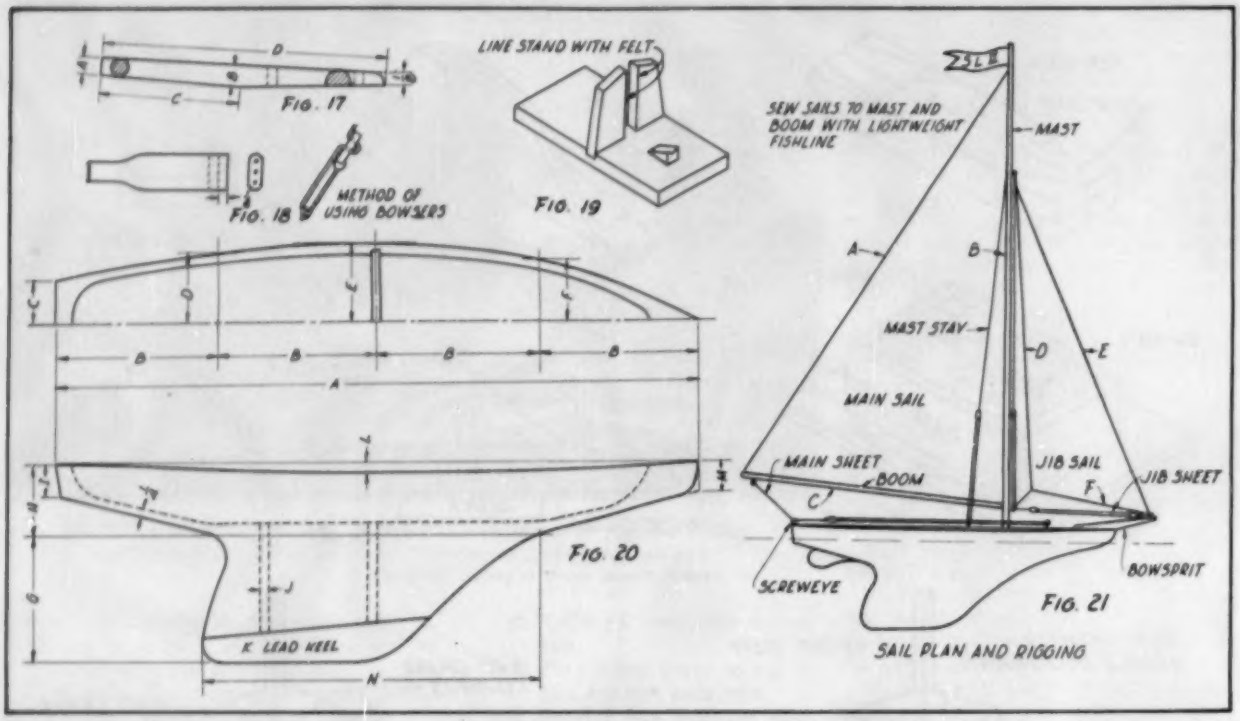
d) A plywood caliper such as is shown in Figure 8, may be constructed, or special metal calipers may be purchased for gauging the thickness.

e) The bow, stern, and bottom of the hull may be left a little thicker than ¼ in.

f) Small holes may be patched with plastic wood and thin spots reinforced with the same material. Large holes should first have a



Construction details of Sandra Lee II



Construction details of Sandra Lee II

Dimension Tables for the Sandra Lee II

TABLE I. Hull dimensions

Model	Class*	A	B	C	D	E	F	G	H	I	J	K	L	M	N
18"	A	18	4½	1¼	2	2¼	1¾	3½	2	⅞	¼	1½ lb.	¼	⅞	10
24"	B	24	6	1⅝	2½	2⅞	2¼	4½	2¾	1	⅜	2½ lb.	⅜	1⅛	13
30"	C	30	7½	1¾	2¾	3¼	2½	5¼	3½	1	⅜	3½ lb.	½	1¼	16½
36"	D	36	9	2	3	3⅝	2¼	6	4	1⅛	⅝	5 lb.	⅝	1½	20

TABLE II. Sail dimensions (finished size after hemming)

		Main Sail			Jib Sail		
Model	Class	A	B	C	D	E	F
18"	A	28	26	13½	16½	19½	7
24"	B	37⅛	34¾	18	22	26	9⅛
30"	C	44	40	24	27½	32½	11¾
36"	D	53	48	29	33	39	14

TABLE III. Mast dimensions

Model	Diameter at top	Diameter at base	Height
18"	¼"	⅜"	30"
24"	¼"	7/16"	39"
30"	5/16"	½"	45"
36"	5/16"	9/16"	53"

TABLE IV. Boom dimensions

Model	Diameter	Length
18"	¼"	14"
24"	5/16"	18½"
30"	⅜"	24½"
36"	⅜"	29½"

TABLE V. Bowsprit dimensions

Model	A	B	C	D
18"	⅛	9/16	2	4
24"	5/16	½	2⅔	5½
30"	⅜	⅝	3½	7
36"	⅜	¾	4	8

*Class according to Portland's annual boat regatta.

solid piece of wood glued in place with waterproof glue.

20. Sand with coarse abrasive paper.

21. With a ¼-in. dowel as a guide lay out the rake or dip on each side of the deck.

22. Plane the rake with a jack plane turned at about a 45-deg. angle.

23. Lay out the position of the deck beams according to this table:

18-in. hull — 1 beam
24-in. hull — 2 beams
30-in. hull — 3 beams
36-in. hull — 4 beams

NOTE: The deck beams should be placed where needed to reinforce the thin deck but should not be placed where they will strike the 4-in. mast support block that will be mentioned in step 26.

24. Beams should be shaped as sketched below:

a) The height *x* at the center of the arc for the middle beam is:
18-in. boat — 1/16 in.
24-in. boat — ⅛ in.
30-in. boat — 3/16 in.
36-in. boat — ¼ in.

b) For boats having more than one beam, the curvature is naturally less as you work toward the ends of the boat.

c) The disk sander is very satisfactory for shaping beams.

25. Beams should be notched ⅛ in. deep into the hull sides, using a sharp knife and a ⅛-in. chisel. Glue in place with waterproof glue.

26. Construct the deck.

a) Trace around the hull on a piece of 3/32 to ⅛-in. thick waterproof plywood. Mahogany is excellent.

b) Saw out on the jig saw, leaving about ⅛ in. all the way around for trimming.

c) Tack in place with 6, or 8, ¾-in. brads.

d) Plane to fit the hull; do not let the plane slant in. Sand smooth.

e) Gauge a line ¼ in. from the edge as shown in Figure 10.

f) Plank the deck using the planking jig.

1. Tack deck to jig with ½-in. brads, lining up with the center line.
2. Drive 2*d*. blue nails in the spaces shown.
3. Place a metal or hardwood straight edge against the nails.
4. Draw lines with the back edge of a Sloyd knife, working from the center out.

g) Stain and fill the deck if a porous wood has been used.

h) Make a mast support block ¾ by 1 by 4 in. out of pine and glue it to the underside of the deck. Use two ¾-in. brads nailed through the deck and clinched on the underside of the block for extra strength.

i) With dividers lay out nail holes ¾ in. apart and approximately 5/32 in. from the outside edge.

j) Varnish, shellac, or paint the inside of the hull two coats, and shellac the underside of the deck.

k) Nail and glue the deck in place. You may use ¾ in. brads which must be set, and puttied with colored putty, or use ½-in. brass escutcheon pins.

l) Clean off surplus glue and sand edges for a perfect fit.

m) Finish deck with 1 coat of shellac and two coats of varnish. Last coat of varnish should be held up until boat is practically complete.

27. Decide whether you want a stationary skeg, an automatic rudder or neither.

28. Glue a skeg block halfway between keel and stern of the boat, lining it up carefully with the center line of the hull.

29. With a sharp chisel, file, and sandpaper, chamfer the skeg and shape as shown in Figure 13.

30. An automatic rudder may be made by cutting off the back of the skeg and substituting a movable metal rudder as shown in Figure 14.

31. Make mast, beam, and bowsprit from the same kind of wood as the deck or use a contrasting colored wood. Sanding of mast and beam may be done in the drill press or a lathe equipped with a chuck.

32. Wrap ends of beam and bowsprit with thread.

33. Drill bowsprit and fasten with round head screws and glue.

34. Place screw eyes in deck and spars.

35. Finish spars with one coat of shellac and one coat of varnish.

36. Construct sliding mast step; following are suggestions.

37. Finish hull as follows:

a) Paint hull with one coat of flat white enamel undercoater.

b) Paint hull with two coats of white enamel.

c) Locate water line by floating in a tank. Parting dust sprinkled on the water before floating will mark the water line when boat is drawn out.

d) Mask down to the line and paint the underwater surface with two coats of enamel.

e) Smooth with 6/0 wet or dry garnet paper and oil.

f) Finish with wax.

38. Construct bowsers by sawing off a toothbrush handle about ⅛ in. long. Drill three 1/16-in. holes in each piece and sand smooth.

39. Make paper sail patterns allowing ¼ in. extra for hems.

40. Make sails of plastic cloth. Your mother or sister may hem them for you.

41. Rig the boat as shown in Figure 17. If desired, two or three stays may be used, but be careful that they do not impede the action of either sail. The mainsail may be laced to the boom and mast, spacing the stitches about 1 in. apart, or brass rings may be used.

42. Make a stand for the boat.

43. Decorate the model to suit yourself. Banners, name plates, cabins, running lights, cleats, chocks, anchors, searchlights, lifesavers, pulleys, turnbuckles, etc., may be added.

44. Learn to sail your boat. Best results are obtained when sailing on a *reach* or having the wind coming from the side. Let both mainsail and jibsail out about 45 deg. from the center line of the hull. Experiment with your sliding mast adjustment until the boat consistently travels in a straight course.

45. Race your model in the annual regatta. Remember, good sportsmanship is traditionally a part of yachting.

An Operation Analysis of Model Boatbuilding

1. How to make a working drawing.
2. How to make a scale drawing.
3. How to make a bill of material.
4. How to plan the procedure for doing a job.
5. How to lay out wood with a rule.
6. How to lay out wood with dividers.
7. How to lay out wood with a try square.
8. How to lay out wood with a marking gage.
9. How to lay out wood with a steel square.
10. How to use the jack plane, including sharpening and adjusting.
11. How to use the chisel for paring.
12. How to use a gouge.
13. How to use boring tools.
14. How to use sandpaper.
15. How to use files.
16. How to use spokeshaves.
17. How to use carving tools.
18. How to use a backsaw, crosscut saw, ripsaw, coping saw, jig saw, and miter box saw.
19. How to use the drill press for drilling holes in metal.
20. How to use the drill press for sanding.
21. How to use the buffer.
22. How to use the power sander.
23. How to use screw drivers.
24. How to use hammers.
25. How to use a Sloyd knife.
26. How to use nail sets.
27. How to use a bench vise.
28. How to use nails and a nail set.
29. How to use screws.
30. How to use dowels.
31. How to use glue.
32. How to square a board.
33. How to use handscrew clamps.
34. How to use jigs and patterns.
35. How to cut, smooth and polish plastics.
36. How to polish metal.
37. How to use stain.
38. How to use filler.
39. How to use shellac.
40. How to use varnish.
41. How to use enamel.
42. How to use wax.
43. How to use lacquer.
44. How to ram a mold.
45. How to make a casting.
46. How to insert cores in a mold.
47. How to use proper nomenclature for tools and processes in wood, metal, and drawing.
48. How to identify lumber and materials used.
49. How to know grades of sandpaper.
50. How to know finishes and their thinners.
51. How to clean stain and enamel brushes.
52. How to cut metal with tin snips.
53. How to solder metal.
54. How to use an awl.
55. How to bend metal.
56. How to use calipers.

PLASTER BAT CABINET

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The general shop ceramic area is very often considered the hardest area to keep clean, and it is only through a constant effort on the part of the instructor that cleanliness in this section can be obtained. The very nature of the materials, used in ceramics, are the cause of most of the dirt. One of the greatest dirt makers aside from the clay, is the large amount of plaster of Paris chips and pieces from broken or misused plaster bats. To help keep the ceramics area clean and prevent the tracking of ceramic material through the shop, it is necessary to have good storage spaces for all materials used. With this thought in mind, a plaster bat storage cabinet is one of the first items that should be constructed when setting up or remodeling a ceramics center.

There are three main advantages to a plaster bat cabinet of this type.

1. It allows the student to use materials

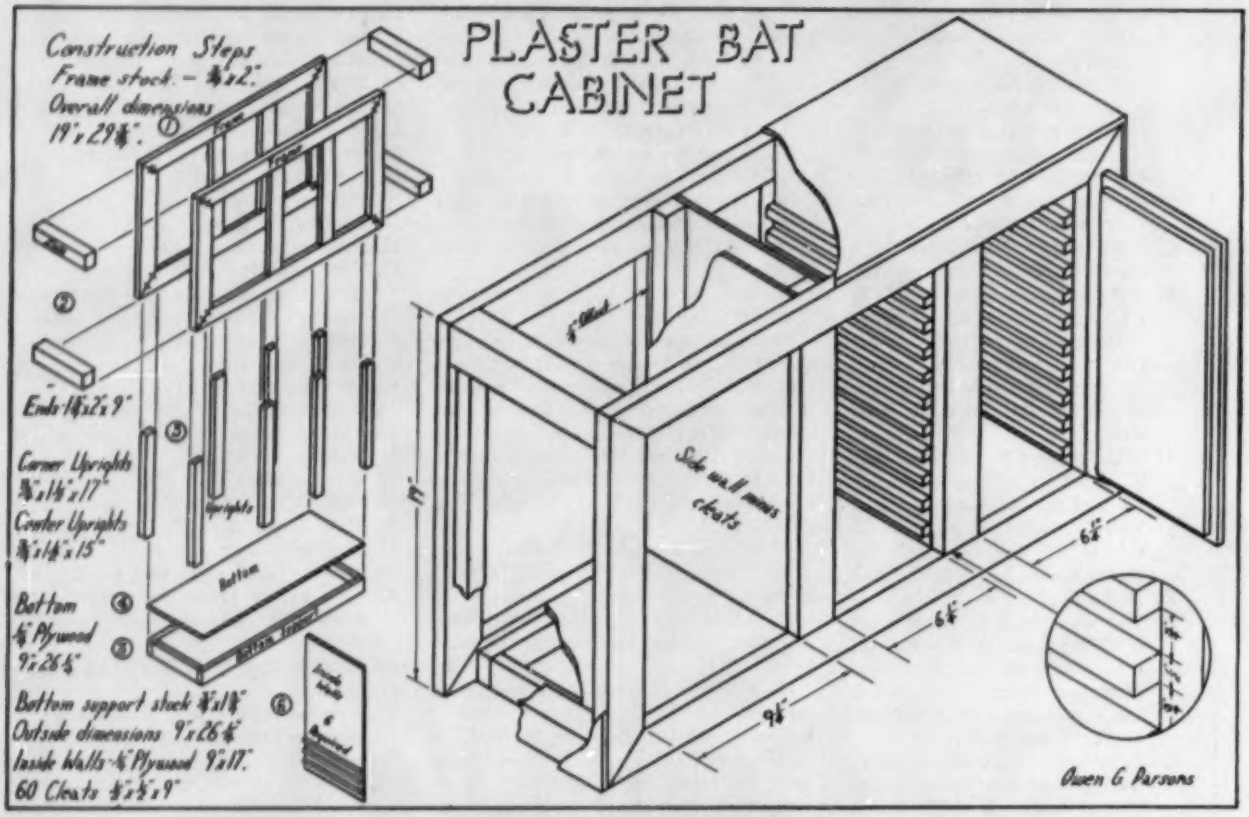


Fig. 1. Details of the plaster bat cabinet

that are considered a natural part of ceramic work, i.e., the use of plaster bats instead of pieces of boards, masonite, etc.

2. The cabinet prevents breakage of plaster bats by preventing them from being dropped one on top of the other.

3. With this type of cabinet the plaster bats are provided with enough circulation of air to keep them dry and in proper condition.

The cabinet is constructed to store ten 9-in. and twenty 6-in. plaster bats. A few tin pie pans make excellent molds for this size bat and provide the student with one more process in ceramics if he is allowed

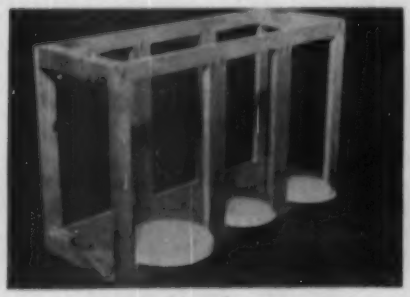


Fig. 2

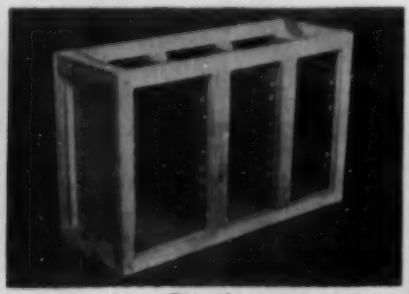


Fig. 4

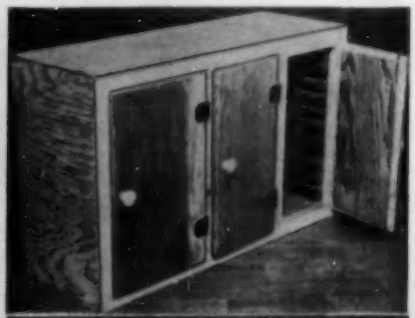


Fig. 3

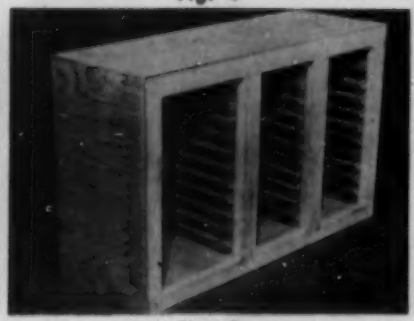


Fig. 5

Figs. 6 and 7

to make his own. If any other size bat is used the openings in the front of the cabinet should be ¼ in. larger than the plaster bats. In such a case, the over-all length of the cabinet and door size must then be adjusted accordingly.

Construction Steps

STEP 1. Construct the front and back frames using ¾ by 2-in. pine. Four pieces 29¾ in., four pieces 19 in., and four pieces 15 in., long are needed. Miter the corners of the eight longest pieces and fasten all parts together with corrugated fasteners. For construction detail see step No. 1, in Figure 1.

STEP 2. Nail in place, four pieces of pine, 1¾ by 2 by 9 in. These end braces go between the front and back frames at the corners. For location of end braces see step No. 2, in Figure 1 and see, also, Figure 2.

STEP 3. Make bottom support from two pieces ¾ by 1¾ by 36¼ in., and two pieces ¾ by 1¾ by 7½ in. For detail of construction see step No. 3 in Figure 1. Nail the bottom support in place as shown.

STEP 4. Make bottom from plywood, ¼ by 9 by 26¼ in. Place bottom inside cabinet and nail down to bottom support. See construction step No. 4 and Figure No. 3.

STEP 5. Cut four uprights ¾ by 1½ by 17 in., and four uprights ¾ by 1½ by 15 in. The four shorter uprights should be nailed in place at the four corners of the cabinet. These four shorter uprights should be set back ¼ in. from the edge of the door frames. The four longer uprights should be nailed behind the four center pieces on the front and back frames. Centering of these four uprights will produce a ¼-in. setback on both edges of each of the four center pieces. See Figures 1 and 3 showing a small piece of plywood being used to test the ¼-in. setback of the uprights.

STEP 6. Six inside walls should be constructed next. Make them from ¼ by 9 by 17-in. plywood. See construction step No. 6.

STEP 7. Cut out sixty cleats ½ by ½ by 9 in. These cleats should then be nailed to the plywood walls. For location of cleats see inset on isometric drawing. Ten cleats will complete each inside wall.

STEP 8. Slide each wall into position in cabinet and nail in place against uprights. The plywood walls will be flush with all door frames. See cutaway on isometric sketch in Figure 1. Also see Figure 4.

STEP 9. The outside cover is made of plywood, two pieces ¼ by 10½ by 19 in., and one piece ¼ by 10½ by 30¼ in. Nail the two side panels on first, keeping top edges flush with frame. Nail the top panel over top of frame and ends of end panels. See Figures 1 and 5.

STEP 10. Material for doors should be 5/8-in. plywood. Allowing for ⅜-in. overhang on all sides, the outside dimensions will be: two pieces 7 by 15¾ and one piece 10 by 15¾. Construct doors and mount with ⅜-in. offset hinges. See Figure 6.

STEP 11. Sand cabinet smooth and finish to match other ceramic area equipment. See photograph Figure 7.

This cabinet when finished and placed in service will do its job perfectly. The shop instructor will really appreciate the cleaner ceramic area made possible by this cabinet.

A THREE-WAY PROJECT

WILLIAM PLUTTE
Principal, De Anza High School
Richmond, Calif.

A shop project can be an end itself, or it can be an integral part of a larger project. To co-ordinate a program requires extensive planning, but the results are usually well worth the time.

Sometimes a co-ordinated program is planned, entirely from the first step; at Portola,* "Operation Corporation" evolved as a result of several unconnected conversations.

The "Don Crafters," an industrial-arts club, had processed fifty *mail dogs* which sold out, in one hour, just before Christmas. During the interim various club projects were followed by interested members, and constant questions regarding "the next sale" were bombarding them.

*Portola Junior High School, El Cerrito, Calif.

After examination of innumerable projects the club decided on a bent-iron book rack. The rack is easily produced, inexpensive as to materials, and highly desirable to students and faculty members. This last factor was determined by displaying a sample and requesting reactions.

Misinterpretation of "reactions" resulted in a swamp of orders, which had to be turned down until production was under way.

An array of plans of many projects were drawn up in the shop drawing classes, with the best being studied by members of the Don Crafters. As mentioned, the book rack was overwhelmingly favored.

After the group decided on the project it was planned to turn out 100 racks for sale. Then a stalemate was reached. The club treasure was defunct.

There was talk f borrowing the necessary 15 dollars for materials, and it was at this stage that the club sponsor fell into a happy conversation with the math teacher, who was teaching in the field of stocks and bonds at the time. At his suggestion a corporation for production was planned.

A meeting was held, with students participating, and a decision was made to sell stock in "Don Crafter, Inc.," with the club maintaining a 51 per cent interest in the enterprise.

Math students drew up sample stocks and a satisfactory copy was forwarded to the print club for production. Sixty individual shares, par value 25 cents, were

Fig. 1. Preferred stock certificates are printed by the members of the print club. (At right) Fig. 2. Purchasers of the stock signing their individual shares

Fig. 3. Getting ready for production. (At right) Fig. 4. Checking the consumers' appeal

struck, and were immediately purchased by students.

The Crafters had working capital and were able to produce the one hundred book racks, which sold for fifty cents each. At a board of directors meeting it was voted to issue a dividend of ten cents a share, or to repurchase each share for fifty cents.

No student may own more than one share, and any resold stock will go at fifty cents. Future productions of the Crafters are to be planned with the understanding that a ten cent dividend must be a goal.

So, what started out as a hobby club, continues as such, but in addition, the Crafters are gaining education in financing, production costs, salesmanship, and thrift.

Actually, this type of project offers unlimited opportunities for learning, and dramatically points out the inseparability of all learning tools.

Each new major project of the club will embrace more learning factors, but what is most important, this type of education is fun, though all the students involved have expended more effort in *Operation Corporation* than is usually true in many classes.

GEAR SHIFT INSTRUCTOR

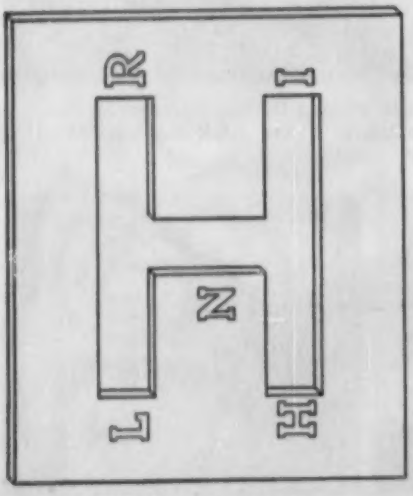
GEORGE W. SCHNEIDER

Driver Training Instructor

El Monte High School

El Monte, Calif.

The gear shift instructor is an instructional aid designed to assist the new driver in learning the gear shift positions. This instructional aid was designed to assist the beginning driver in gaining a mental picture of the gear shift positions. It can be used in the classroom by moving a pencil through the opening or in the car by holding it in the proper position with the gear shift lever in the slot, as shown in Figure 1.



Gear shift instructor by George W. Schneider

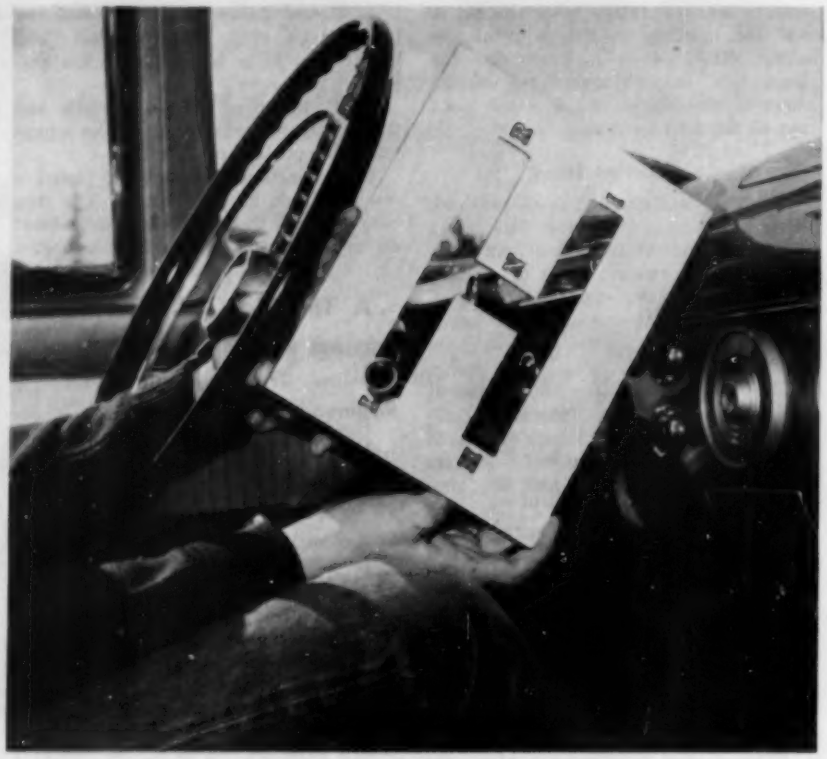


Fig. 1. Method of using gear shift insrtuctor

Construction materials can be plywood, pressed wood, sheet metal, or opaque plastic. Decal letters constitute an easy medium for lettering. A light color is best suited, as it gives a better color contrast when this training aid is being used.

A BASIC PHOTOGRAPHY UNIT FOR THE GENERAL SHOP

R. PAUL LIGHTLE

Industrial Arts Instructor

James H. Smart School

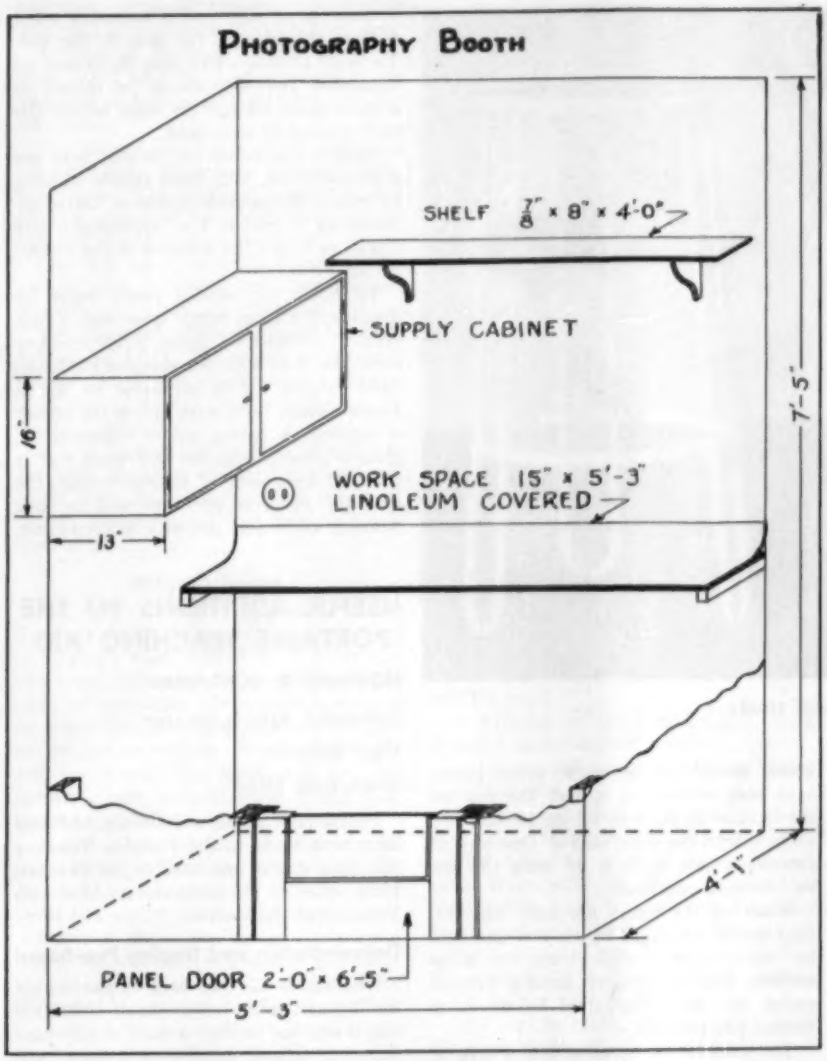
Fort Wayne, Ind.

It has been my observation that many industrial-arts teachers would like to add photography to the curriculum of the general shop. A few have gone ahead while others hang back for one reason or other. In discussing this problem with fellow-teachers three reasons are usually given why they are reluctant to enter this area of instruction. (1) The teacher does not feel qualified in the area. (2) Some have the idea that the necessary equipment is both elaborate and expensive. (3) There is no ideal location available in their shop. If one accepts either of these three reasons without further exploration, he will be missing one of the most satisfying and popular areas of the hobby field.

Photography can be expensive, but it need not be. In establishing our unit we selected the following basic equipment and supplies. You may want to vary this list or go in deeper than we have; if so, more power to you. With the items listed you will be able to teach the beginner three basic things: (1) How to mix chemicals correctly. (2) How to develop a roll of film. (3) How to make prints. These fundamentals will satisfy the curiosity of the beginner. With this basic knowledge many students will establish darkrooms in their homes and go on to more advanced photography as a hobby or perhaps to professional careers.

The picture of the photography booth was drawn with only part of the front and right side showing in order to show the pictorial interior arrangement. The top of the booth was left off to further clarify the interior. The frame of the booth was constructed out of two by fours. Regular $\frac{7}{8}$-in. sheathing was used for the walls, except for the front where $\frac{1}{4}$-in. plywood was used. This construction has proved to be satisfactory for our purpose.

The booth was designed and built to this shape and size to best fit our situation. It is far from ideal — as it does not have running water. Since we could not have an



Layout of photography booth

ideal situation we settled for something less — isn't it ironic that we usually do? While not ideal, it certainly is satisfactory. It was inexpensive! It can be built in a short time! It can stimulate a great deal of interest in a fascinating hobby for the student and the teacher. Running water is highly desirable but not absolutely necessary. After the film and prints have been developed they are carried outside the booth to a sink where running water is available.

The booth is small but I have had as many as six junior high school boys in this booth for a short demonstration, all at one time. Students too are trained to serve as student instructors. These students go into the darkroom with beginners, teaching them the basic skills they need to know in order to make prints and develop film.

The inside walls of the booth are painted with flat black paint. Cracks in the sheathing were filled with knife grade calking compound. A vent was placed in the ceiling to allow for air circulation.

In the ceiling of the booth we also have an electrical outlet supplied with an ordinary 7½ watt, dark red bulb. This bulb gives sufficient light so that one can see what he is doing while working with films and print papers, but still does not affect the sensitivity of the materials. High speed film needs to be developed in complete darkness, hence these experiences would be reserved for advanced phases of photography.

The door of the booth was a second-hand panel door. It was carefully fitted to eliminate outside light seepage. A piece of heavy cloth was folded and nailed along the bottom edge of the door to prevent light from entering at this source.

One double outlet for 110 volts is available to supply current for the electric clock which we use for a timer. The print box also plugs into this outlet.

The storage cabinet is built with two compartments. The left side serves as storage for the print box and the number of sheets of print paper requested by the pupil. The right compartment serves as storage for our supply of tri-chem packs, printing papers, and other consumable supplies. Both compartments are fitted with ¼-in. plywood doors which have ⅜-in. lipped edges. Each door has a cylinder lock so they may be kept locked when not in use.

Equipment and Supplies

Some of the items needed, or their substitutes, are available around the home or school, some may be built in the school shop, and some must be purchased either new or secondhand. The items listed are basic. If you have had experience in photography you may want to add to this list for your situation.

1 wall cabinet (shop made)
3 one pint jars or amber bottles — no cost
1 enamel pan for washing prints
1 timer. We chose an electric clock with a second hand. Cost $4 (new)
1 squeegee, 50¢
4 photo clamps, 60¢
1 rubber print roller, 95¢
1 — 7½ watt, dark red bulb, 15¢
1 blotter book, 9 x 12 in., 65¢
1 plastic stirring rod, 15¢
1 photographic thermometer, $5 (used)
1 ferrotype plate 10 x 14 in., 85¢
1 contact print box, $10
3 plastic developing trays, 3 x 10, $2.49
100 sheets of photographic paper (We use Kodak single weight Velox F — 3, 2½ x 3½, 81¢ per pack.)
8 tri-chem packs (These packs contain chemicals needed to develop film and also make prints.) 25¢ each, $2

Should you add up the above you will get $29.15 for the items listed. This total may vary slightly as circumstances vary for each situation.

The beginner will find these two references very useful in setting up such a basic area as just described.

1. "Developing, Printing and Enlarging with Kodak Materials," Eastman Kodak Company, Rochester 4, N. Y. (25¢)
2. "Developing and Printing Made Easy," Ansco, Binghamton, N. Y. (25¢)

In addition to the above references a trip to the library will probably uncover several additional references that you may wish to examine carefully before purchasing for school use.

WELDED METAL STOOLS

PROFESSOR DELBERT A. DYKE

On leave from Sul Ross State College
Alpine, Tex.

Welding is one of the things which can be learned to a great extent by practice. A good way for the student to gain skill

Welded metal stools

is by making a project that requires welding in its construction and at the same time is useful when finished. The ideal project should afford a maximum number of opportunities for practice at minimum cost and should have real utility. A kitchen stool is useful and does not require a great amount of material. A stool made entirely of metal offers an opportunity for considerable practice with the welding torch and with other metalworking tools and operations.

The stock used in constructing the stools shown here was ½-in. seamless steel tubing. It is advisable to bend the tubing to desired shape before cutting to length. Bends should not be made where pieces have been welded end to end. The rim for the top can be made of tubing formed into a circle with the ends welded. One way of forming a neat circle is by using the slip rool forming machine.

When all the pieces are bent and cut, they should be placed in position and held by small clamps while they are tack-welded. This preliminary tacking permits truing up the entire stool before it is welded permanently.

To complete the construction, a disk of 16-gauge black iron is cut and welded on to the rim to form the seat. A neat job can be done by cutting the disk slightly oversize so no filler rod is necessary when welding the edge of the seat to the rim. To avoid trouble which may be caused by expansion, the disk should be tacked in several spots around the edge before the final welding is attempted.

Another suggestion for the seat is to use a plywood disk with foam rubber padding covered with washable plastic or fabric upholstering material. Use appropriate size screws to fasten the plywood to the welded frame.

To finish the welded stool, begin by dressing down any rough spots with a disk sander, followed by filing. Final finishing should be done with fine abrasive cloth and hand rubbing. It is advisable to use a grease solvent for a wash before the primer is applied. A baking primer, sprayed on, gives a good foundation and when this is followed by a coat of baking enamel, the resulting finish is one that will be long wearing, attractive, and easy to keep clean.

USEFUL ADDITIONS TO THE PORTABLE TEACHING AID

HOWARD R. SCHRAMM

Industrial Arts Instructor

High School

Shadyside, Ohio

Several useful and worth-while additions have been made to the Portable Teaching Aid since it was presented in the October, 1953, issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Demonstration and Display Peg-Board

Although it has only been on the market for approximately two years, Masonite Peg-Board has become a most widely used material. Offices, homes, workshops, and stores have readily accepted this versatile product which was originated by B. B. Butler. The alert and creative industrial

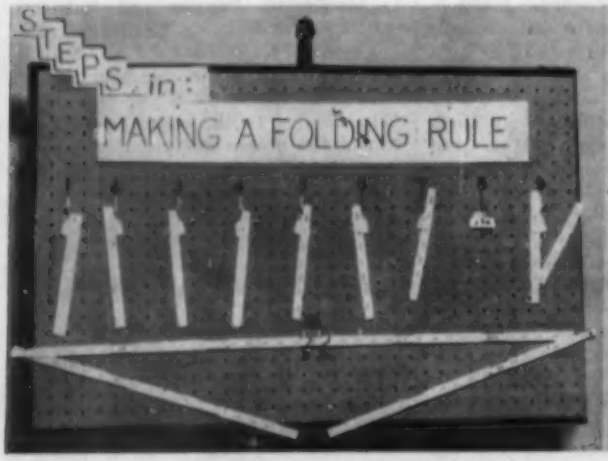


Fig. 1. Using the demonstration and display pegboard. (At right) Fig. 2. Using the magnet board

education instructor can find innumerable uses for the peg-board in the school shop.

A piece of Masonite Peg-Board ⅛ in. thick and 2 by 3 ft. in size is used in the Teaching Aid as a demonstration or display panel.

The demonstration side of the peg-board has been given three coats of green chalkboard paint. This makes it possible to add printing, sketching, etc., to the tools, mock-ups, and charts hung on the board.

One such use is shown in Figure 1. The various steps in making a folding rule can be easily and effectively presented.

The other side of the peg-board has been painted flat black. This makes an excellent display board on which small projects, mock-ups, drawings, and charts can be neatly displayed.

A wide variety of hanging fixtures are available. However, the shelf brackets and hooks have been found to be the most useful. These fixtures can also be made from wire.

Magnet Board

The other addition to the Portable Teaching Aid is the magnet board. A piece of 20-gauge steel sheet 2 by 3 ft. in size was given three coats of green chalkboard paint on both sides. The magnet board can be either slid into the grooves on one side of the aid or quickly placed against the side containing the Magnagrip Jr. tool holders, where eight of these strong magnets firmly hold it in place.

Material can be held on the magnet board by using "Maggies" which have clips attached or by gluing or scotch taping small magnets to the back of the material.

Figure 2 shows one use of the magnet board. The micrometer is held on the board by a magnet which has been taped to the thimble of the micrometer. The chart "How To Read A Micrometer" is fastened to the magnet board with "Maggies."

WALL DECORATIONS MADE OF WIRE COAT HANGERS

LORNE E. BUNT

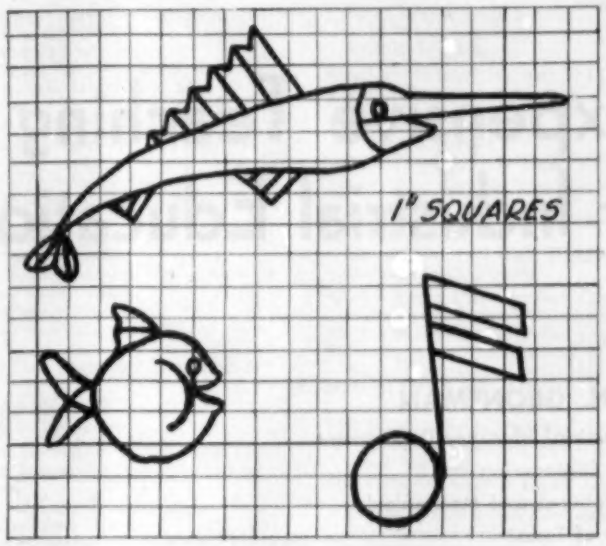
Annette Public School

Toronto, Ontario, Canada

If you wish a Grade VIII or Grade IX project which is: (*a*) modern, (*b*) interesting, (*c*) useful, (*d*) intriguing, yet not too difficult, (*e*) allows complete freedom of expression, (*f*) costs practically nothing for materials, (*g*) can be used to teach soldering and give plenty of practice after the lesson is taught, then try making wall decorations from coat hanger wire. The student can advance to small table lamps once the bending and soldering lessons have been mastered.

Procedure

1. Obtain several coat hangers, all made from the same size wire.



A few suggestions that you might try

2. Use heavy pliers to cut off and discard the hook.
3. Straighten the wire by using a mallet and the anvil.
4. Remove *all* paint or lacquer, using abrasive paper or steel wool.
5. Draw a full-size pattern of the design to be followed.
6. Form the wire freehand using pliers, pipe, etc., to make the various shapes needed. Make all joints at corners if possible. When soldering allow the solder to form a fillet at each joint. Fish eyes may be formed from washers or made out of galvanized iron scraps. Solder on top of a flat surface so that the finished product will hang flat against the wall.
7. After the assembly is complete, wash the work thoroughly in soap and water to remove all grease and flux.
8. Finish by giving the entire work one or two coats of dead black paint.

IMPROVING THE STUDENTS' ATTITUDE

EDWARD R. ROBERTS

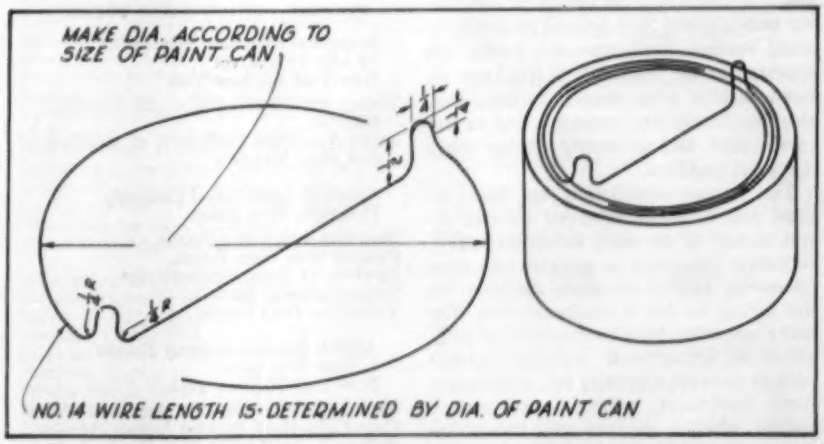
Industrial Arts Instructor

High School

Whittier, Calif.

In place of using the old and negative term *Required Projects* change the wording to *Learning Projects*, and notice the marked change in student attitude and almost complete removal of "Why do I have to make this." They all realize that a baby has to learn to crawl before he can walk — so must they, and a *Learning Project* is used for this reason.

It really has changed many unfavorable attitudes by removing a negative term.



Paint can drip wire by John C. McCrory, industrial arts department, Penn High School, Greenville, Pa.

Inexpensive Teaching Materials For Industrial Education

CHRIS H. GRONEMAN
Head, Industrial Education Department
School of Engineering
The Agricultural and Mechanical College of Texas
College Station, Texas

It has been the pleasure of the author to retain a perpetual listing of companies, manufacturers, publishers, and other agencies which have prepared for release inexpensive materials which would be available for instructional purposes in educational programs of schools, colleges, universities, and industries.

This project was started approximately 20 years ago in support of a talk to a group of industrial teachers who were interested in the availability of such materials to assist them in teaching their regular programs. The immediate response indicated a very favorable reaction which was encouraging to the extent that a perpetual listing was kept.

Periodically this listing or compilation has been released through the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine through the invitation of the Editor and it is hoped that the efforts in mentioning such a listing have proved profitable to many readers. Each time the listing has appeared in the magazine, it has been altered slightly with respect to categories, also the listing has increased due to the co-operation and generosity of the many industrial concerns.

The present compilation has been revised and naturally expanded through direct inquiry to the many industries, manufacturers, companies or agencies who have interesting helpful materials available for the asking or for a minimum cost. The many materials have been placed in categories of instructional materials content such as drawing, electrical and communications, handcrafts, industrial and general, metals, plastics, professional, transportation, and woods. Under each of these categories the materials are classified as bulletins and booklets, charts and samples, and films. All of these materials certainly are to be construed as aids for visual education. The teacher or educator who browses through this compilation either hurriedly or in detail, will be rewarded for the time spent by an enlightened and enriched understanding of the many helpful materials available merely for the asking.

An attempt has been made to indicate the price of each item where such was stipulated. The others may be presumed to be available free of charge. It is suggested, however, that any request for such materials should be made on school or institutional letterhead stationery. All requests should be made directly to the company mentioned, and not to the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine or to the author.

DRAWING — BULLETINS AND BOOKLETS

Acoustical Materials Association
59 East 55th Street
New York 22, New York

Theory and Use of Architectural Acoustical Materials
Sound Absorption Coefficients of Architectural Acoustical Materials

American Lead Pencil Company
Hoboken, New Jersey

Sketching with Venus Pencils
Painting with Venus Pencils
Portfolio of Venus-Scholastic Art
Venus Technical Test Kit
Venus Blue Print Pencils

Asphalt Roofing Industry Bureau
2 West 45th Street
New York 36, New York

Good Application Makes A Good Roof Better
Plain Facts About Buckled Asphalt Shingles
How to Repair Asphalt Strip Shingle Roofs
Manufacture, Selection, and Application of Asphalt Roofing and Siding Products, 40¢

Berger Scientific Supplies, Inc.
342 Madison Avenue
New York 17, New York

Berger Solar Ephemeris and Polaris Tables
Berger Equipment
Berger Scientific Supplies, Inc., Catalog "A"
Accuracy. . . . In Action

Casting Specialties Company
Thiensville, Wisconsin

School Shop Tested Projects, price $1.00

Cleveland Twist Drill Company
1242 E. 49th Street
Cleveland 14, Ohio

Decimal Equivalents of Drills
Ready Reference Charts
"U & C of Reamers"
"U & C of Twist Drills"

Dietzgen Company
1046 West Fullerton Avenue
Chicago 14, Illinois

Booklet for Use and Care of Drawing Instruments
Simplified Instructions for Printmaking

Donley Brothers Company, The
13900 Miles Avenue
Cleveland 5, Ohio

Directions for Building

Frederick Post Company, The
Hamlin and Avondale Avenues
Chicago, Illinois

Tracing and Drawing Mediums
Furniture for the Drafting Room
Drawing Instruments
Sensitized Products Papers and Supplies
Catalog of Drafting Materials for School Use

Hardwood Dimension Manufacturers Association, Inc.
Heyburn Building
Louisville 2, Kentucky

Hardwood Interior Trim and Molding Commercial Standard CS76-39
Hardwood Stair Treads and Risers Commercial Standard CS89-40
Solid Hardwood Wall Paneling Commercial Standard CS74-39

Higgins Ink Company, Inc.
271 Ninth Street
Brooklyn 15, New York

Ink Sketching
History of Ink
Biography of Chas. M. Higgins
Color Card
Color Card Bottle Base

Illinois, University of Small Homes Council
Mumford House
Urbana, Illinois

A1.3 Financing the Home, 10¢
A2.0 Business Dealings With Architect and Contractor, 10¢
B3.0 Land Design, 10¢

C5.1 Household Storage Units, 10¢
C5.11 Storage Partitions, 10¢
C5.31 Cabinet Space for the Kitchen, 10¢
C5.32 Kitchen Planning Standards, 10¢
C5.9 Garages and Carports, 10¢
C7.2 A Basic Farmhouse Plan, 10¢
F2.0 Basements, 10¢
F3.0 Wood Framing, 10¢
F6.0 Insulation, 10¢
F6.2 Moisture Condensation, 10¢
F7.0 Chimneys and Fireplaces
F11.0 Window Planning Principles, 10¢
F15.0 Hardware, 10¢
G3.1 Heating the Home, 10¢
G3.2 Controls For Central-Heating Systems, 10¢
G3.5 Fuels and Burners, 10¢
G3.61 Homes Planned For Coal or Coke, 10¢
G5.0 Plumbing, 10¢
G5.5 Septic-Tank Systems, 10¢
G6.0 Summer Comfort, 10¢
H1.0 Interior Design, 10¢
Homes From Pre-Assembled Wall Panels, $1.00
Contemporary Houses Developed from Room Units, $1.00
Fourteen Split-Level Houses Designed for Solid-Fuel Heat, 50¢
Handbook of Kitchen Design, $2.00
Wall-Panel Construction, 25¢
"W" Roof Truss, 25¢
3/12-Slope Truss for 20'-8" to 30'-8" Spans, 25¢
Trussed Roof-Frame for 1½-Story Houses, 25¢
Construction of Storage Partitions, 25¢

Kansas State College
Engineering Experiment Station
Manhattan, Kansas

Thought Process in Drawing

Keuffel and Esser Company
Adams and Third Streets
Hokoben, New Jersey

You Can Do "Professional" Lettering With the Doric Lettering Set
Right Angles With Pocket Instruments
Pocket Transits, (After Brunton) Hand Level
Solar Ephemeris and Surveying Instrument Manual
Graph Sheets Coordinate Papers and Cloths
How to Use the New Paragon Drafting Machine
The Consistent Log Suplex Decitrig
So You're Going to be an Engineer
Templates and Other Drafting Tools
Elementary Instructions for Operating the Slide Rule
Leroy Lettering and Symbols
This Modern Instrument Can Give You Three Things You Need Most Today
Precision Aligning and Measuring at Lower Cost-Optically
Photact
Making Diazo Prints
Doric Lettering Set, pamphlet
Paragon Drafting Machine, catalog
All-Purpose Level, catalog
A Slide Rule With Intellect and . . . Horse Sense, booklet
K&E Builders' Transit-Level, brochure

Maple Flooring Manufacturers Association
35 East Wacker Drive
Chicago 1, Illinois

Architects' File of Facts Architects' Edition — Guide Specifications
A Glimpse of an Interesting, Modern Home
Hard Maple Flooring
Heavy Duty Finishes for Maple Flooring

National Lumber Manufacturers Association
1319 Eighteenth Street, N. W.
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Wood Structural Design Data Supplement No. 1 — Working Stresses For Structural Lumber
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814 Sterick Building
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Specification Manual for Certified Oak Floors
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Oak Floors for Your Home
Specification Manual — NOFMA, CERTIFIED OAK FLOORS — PREPARATION, LAYING, FINISHING
The Hardwood Flooring Handbook

National Retail Lumber Dealers Association
Suite 302, Ring Building
Washington 6, D. C.

Inside the Retail Lumber and Building Materials Industry
Here's A Better Way to Build, $1.00
Exposing the Termite

P & H Sales Corporation
5650 North Western Avenue
Chicago 45, Illinois

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Southern Hardwood Producers, Inc.
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Structural Design, Modern Timber Engineering, $1.50
Standard Specifications for the Fabrication and Design of Structural Glued Laminated Southern Pine
Southern Pine Manual of Standard Wood Construction, $1.50
Designs for Roof Trusses
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How to Build Southern Pine Smaller Farm Structures, 15¢
Heavy Duty Flooring and Roof Decking
Low Cost Homes, 15¢
Livable Homes of Southern Pine, 25¢
Your Home and How to Build It, 25¢
The Way to Build the House to Last
End Matched Southern Pine

Superintendent of Documents
Washington 25, D. C.

Housing, 1950 Housing situation in charts, based on preliminary results of 1950 census of housing. Revised 1952, 25¢

Tennessee Valley Authority
Knoxville, Tennessee

How Topographic Maps Are Made

Timber Engineering Company, Inc.
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No. 3. — Lintels to Jamb, Sill to Jamb, Jamb Stud to Plate
No. 4 — Rafters to Headers, Headers to Double Rafters, Dormer Studs to Double Rafters, Dormer Rafter to Plate
No. 5 — Girt to Post
No. 6 — Joists to Trusses
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No. 9 — Stair Carriage to Header or Trimmer
No. 10 — Joists to Beam, Beam to Post
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No. 12 — Corner Post Anchorage
Anchor 'Em Down Wth Trip-L-Grip Framing Anchors for Better and Stronger Farm Structures

United States Government Printing Office
Division of Public Documents
Washington 25, D. C.

Guidance Leaflets: Architecture, 5¢ Catalog No. I 16:44:10
Light Frame House Construction, 60¢ Catalog No. FS 5.123: 145

United States Plywood Corporation
55 West 44th Street
New York 36, New York

Weldtex the Striated Weldwood Plywood that Creates Entirely New Interior and Exterior Effects
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The Weldwood Catalog
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Suggested Arrangements of Weldwood Plywood Paneling for Interior Walls
Combed Plywood will Give Your House a Lift

V. & E. Manufacturing Company
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758–766 South Fair Oaks Avenue
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Historical Note on Drawing Instruments
VEMCO Drawing Instrument Catalog
VEMCO Drafting Machine Brochure

Veneer Association, The
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The Farm Book
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Western Pine Association
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Knotty Pine Paneling Patterns
Research Laboratory Note No. 34: Treating White Fir Millwork
Enchanting Homes of Western Pines
Bunk Bedroom Details
Modern Welsh Dresser Details
Pine Paneled Staircase Details, The
Remodeling Denfelds
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Frederick Post Company, The
1215 Capitol Street
Houston 1, Texas

Line Gauge Transfers For The Square Blade
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Canal Building
New Orleans 4, Louisiana

Principles of Frame Construction

DRAWING — FILM MATERIALS

American Central Division
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AVCO Manufacturing Corporation
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The Key to Convenient Kitchens, 16mm. color and sound
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Who Put the Cabinets in Mrs. Murphy's Kitchens?, sound slide

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Tacoma 2, Washington

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How to Finish Plywood, 16mm. color and sound
Prefabrication with Plywood, 16mm. color and sound

Frederick Post Company, The
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Twenty-minute film on OPERATION OF SLIDE RULE (Mannheim type) 16mm.

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Request from the western states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming should be addressed to:

General Motors Corp.
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San Francisco 4, California

Exhibitors in Greater New York and on Long Island should write to:

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Department of Public Relations Film Section
1775 Broadway
New York 19, New York

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Chicago 11, Illinois – 140 East Ontario St.
Cincinnati 2, Ohio – 9 Garfield Place
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Detroit 1, Mich. – 4754 Woodward Ave.
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Omaha 2, Nebraska – 1410 Howard St.
Philadelphia 7, Pa. – 243 So. Broad St.
Pittsburgh 22, Pennsylvania – 339 Blvd. of the Allies
St. Louis 5, Mo. – 612 No. Skinker Blvd.
Oakland 9, California – 6117 Grove Street (San Francisco Area)
Seattle 5, Wash. – 5514 University Way
Washington 5, D. C. – 903 15th St., N.W.

The Very Idea, 30 minutes, color
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The What, Why and Where of Speed Heating, 16mm. black and white sound
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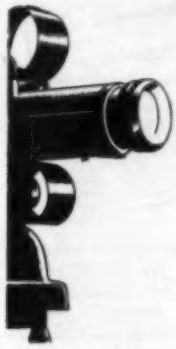
Design for Better Living, 16mm. black and white sound

Revere Copper and Brass, Incorporated
230 Park Avenue
New York 17, New York

The A-B-C of Radiant Panel Heating. 16mm. color sound

(Continued on page 72A)

STANLEY SHOP TALK



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Eight strips of 35mm. safety film in individual cans with a manual of suggested questions for testing.

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$5.00 per set, packed in a handy box, postpaid, with a booklet of suggested test questions. Use the coupon.

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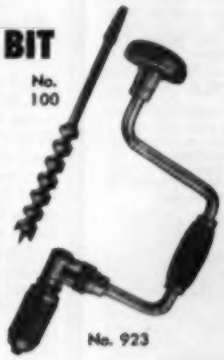
The Stanley "100 PLUS" No. 100—The Russell Jennings auger bit shown here is ideal for use with the 923 Brace. Individually tested, this double threaded screw point bit bores easily and cuts a smooth, accurate hole. Sizes 3/16" to 25/64".

The Stanley "100 PLUS" No. 923—This brace features the new, built-in Self-Centering Chuck that makes bit centering automatic and positive. It holds any size auger bit and straight shank drills from 1/4" to 1/2". 6, 8, 10, 12 and 14" sweep.



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The Yankee "100 PLUS" No. 41—The mechanic's friend, this sturdy all metal tool is a handy shop tool. Bores small holes quickly with a one-hand drilling action. The drill point in use is locked in. Eight drills from 1/16" to 11/64" (by 64ths) are stored in the magazine handle.

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The STANLEY No. 61—Used with the versatile and popular STANLEY R8A Electric Router, this dovetail fixture adds cabinetmaker skill to school shop woodworking. Both front and side piece of the dovetail joint for drawer fronts are cut simultaneously in a few seconds with the R8A router and this attachment. Order the new router manual, *The Router—What It Is and Does.* 38 pages of information with more than 100 illustrations. Regularly 50¢, only 35¢ to schools.

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SCHOOL.....

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CASTOLITE SCHOOL SHOP PROJECTS

These industrial, botanical, biological and decorative embedments in Castolite Liquid Casting Plastic are a few examples illustrating the scope and possibilities of this versatile resin.

WHAT IS CASTOLITE? It is a thermosetting, transparent casting plastic. The syrup-like liquid is easily poured into molds of various types. When mixed with a catalyst, it will harden at low temperature and the finished casting is permanent, solid, clear as glass.

Teacher and students embedding wood seeds and insects.

Can Be Sawed, Drilled, Carved, Turned

Castolite can be handled as easily as hardwood or soft metal and may be worked with hand or power tools. *Brilliant color effects* and matching or contrasting color combinations can be produced by merely mixing a few drops of dys with the liquid Castolite. Because of its versatility and unusual workability, Castolite is suitable for the grade school student while at the same time meeting the exacting requirements of the skilled laboratory technician.

Many Industrial and Scientific Uses

Many of this country's outstanding industrial firms are using Castolite for embedding sensitive instrument components for permanent display or record, and scores of similar applications. The molding, casting and duplicating of gears, wheels, rods, housings and other parts for construction of animated displays is accomplished with the aid of Castomold, a flexible molding compound, another product of The Castolite Company.

Stimulating Handcraft Material

Ever popular with students, and teachers, too, are such take-home projects as jewelry castings, key tags, desk sets, coasters and paper weights containing such varied objects as colorful flowers, butterflies, beetles, shells, star fish, coins, photographs, to name only a few. Not only are most of them easy to do but they are also inexpensive, *costing as little as 5¢ and few of these casting projects will be more than a dollar.*

Should you have any doubts about the educational value of these novelty projects, it is well to remember that the principles of casting can be learned quicker and more easily with small and simple embedments. When the student "gets the hang of it," he will be ready for the more advanced techniques required for the larger and more complicated industrial castings.

How to Get Started

Begin with the class project kit described here. Let the students participate right from the start. Every class has several boys with a surprising aptitude for casting. The instructions are so clearly written and illustrated that every one will be able to succeed with the simpler projects without time consuming experimentations.

Authorized purchases are shipped on open account. If you prefer to order on your own account, to be paid for by the students, your check with order will be appreciated.

FREE INSTRUCTION FOLDER

Do you want more facts before requisitioning any material? The shop instruction folder described in the adjoining column is free to all teachers of Industrial Arts Departments. *Write to School Dept. K-50.*

CASTOLITE CLASS PROJECT KIT

This Kit has been assembled with great care to equip you with the basic casting supplies for making several hundred specialty castings from small buttons and key tags to larger display castings for scientific and industrial embedments. *Castings can be made for as little as 5c each.*

Several dyes, including phosphorescent pigments, pearl essence and pearl flakes, will enable you to create beautiful color effects. All of the standard metal and ceramic molds can be used over and over again.

CASTOLITE CLASS PROJECT KIT (F.O.B. Woodstock) Cat. No. CS-1..... $25.00

THE CASTOLITE COMPANY, Woodstock, Illinois

● Producers and Distributors of Casting, Laminating, Coating and Molding Resins. Serving Industry, Science, the Arts and Crafts.

BASIC PROCEDURE

As Prepared by Teachers

Keeping the teacher's viewpoint and problems ever in mind, shop instructions have been prepared by teachers who are actually using these projects in their own schools.

The new Instruction Folder, "Fiberglass and Liquid Plastics in School Shop" was written by teachers for teachers. A free copy will be mailed to all Industrial Arts teachers upon request.

Laminating, casting and molding with liquid plastics and fiberglass is of the keenest interest to students because they are beginning to see evidence of these new materials all around them. General Motors' Sports Corvette is only one exciting example of the use of fiberglass that sets the mechanically inclined boy's imagination in motion.

Fiberglass Laminates Are Wood and Metal Shop Projects

These versatile resins are combined with wood and metal and prove to be a valuable educational adjunct to your projects in those materials. Individual structures of practically any size and shape, even those with complicated compound curves, can new be formed by the hand lay-up method that formerly could be made only with enormously expensive equipment in the mass production industries. In strength and appearance, they compete with metals with the additional advantage of light weight and the fact that these laminates do not rust nor corrode.

Keep These Facts in Mind

Because the immediate start is a factor in bringing your work up to the level of the trend —

1. **The existing course set-up is left as it is. No reorganization is needed. The resins are merely combined with wood or metal as shown in our manuals. Combination projects are the trend today.**
2. The purely experimental period is completed, both in industry and schools, so that class experimentation is no longer necessary.
3. Students may proceed with the simple projects illustrated and described in the manuals. You merely assign the general instructions and the materials and let the class work from the manual.
4. Shop organization can solve the problems of getting started. A "chief chemist" and asistant, to be appointed by you, can relieve you of details and also control the supplies.
5. The class may be allowed to create its own projects, which will greatly add to the interest and achievement of results. You will be following the careful judgment and successful courses already adopted in numerous vocational and public schools and colleges throughout the country.

WHO USES CASTOLITE RESINS?

Leading Universities, Industrial Corporations, Government Agencies and Institutions including those of Army, Navy and Air Force use Castolite resins for hundreds of industrial and scientific applications. Among them are the following:

UNIVERSITIES & COLLEGES

Alabama Polytechnic Institute - - - Auburn, Ala.
Arizona State College - - - - - - Tempe, Ariz.
Battelle Memorial Institute - - - Columbus, Ohio
Calif. Institute of Technology - - Pasadena, Calif.
Colorado A. & M. College - - Fort Collins, Colo.
Colo. State College of Education - - Greeley, Colo.
Columbia University - - - - - New York, N. Y.
Cornell University - - - - - - - Ithaca, N. Y.
Eastern Kentucky State College - - Richmond, Ky.
Harvard University - - - - - Cambridge, Mass.
Indiana University - - - - - Indianapolis, Ind.
Iowa State College - - - - - - Ames, Iowa
Iowa State Teachers College - - Cedar Falls, Iowa
Loyola University - - - - - - New Orleans, La.
Mass. Institute of Technology - - Lexington, Mass.
McGill University - - - - - - Montreal, Canada
Michigan State College - - - East Lansing, Mich.
Milwaukee-Downer College - - - Milwaukee, Wis.
Newbold Trng. School, State Teachers - - - - - - - - - - - - - - - Fayetteville, N. C.
N. J. State Teachers College - - - Newark, N. J.
Northern Ill. State Teachers College - De Kalb, Ill.
Northwestern University - - - - - Evanston, Ill.
N. W. Missouri State College - - - Maryville, Mo.
Oak Ridge Inst. of Nuclear Studies - Oak Ridge, Tenn.
The Ohio State University - - - Columbus, Ohio
Purdue University - - - - - - Lafayette, Ind.
Princeton University - - - - - Princeton, N. J.
State Teachers College - - - - Fitchburg, Mass.
State University of Iowa - - - Iowa City, Iowa
Stout State College - - - - - - Menomonie, Wisc.
Tulane University - - - - - - New Orleans, La.
Tuskegee Institute - - - Tuskegee Institute, Ala.
University of Arizona - - - - - - Tucson, Ariz.
The University of Chicago - - - - Chicago, Ill.
University of Illinois - - - - - - Urbana, Ill.
University of Kentucky - - - - - Lexington, Ky.
University of Michigan - - - - Ann Arbor, Mich.
University of Minnesota - - - Minneapolis, Minn.
University of Nebraska - - - - - Omaha, Nebr.
University of Pittsburgh - - - Pittsburgh, Penna.
University of Southern California - Los Angeles, Calif.
The University of Texas - - - - - Austin, Texas
University of Western Ontario - - London, Canada
Wisconsin State College - - - - La Crosse, Wis.
Yale University - - - - - - New Haven, Conn.

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Dominion Magnesium Ltd. - - - - Holly, Canada
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Ford Motor Co. - - - - - - - - Dearborn, Mich.
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The Mosler Safe Co. - - - - - - Hamilton, Ohio
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Sangamo Electric Co. - - - - - Springfield, Ill.
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Shell Development Co. - - - - - Houston, Texas
Stewart-Warner Electric - - - - Chicago, Ill.
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U. S. Steel Corp. - - - - - - Pittsburgh, Penna.
Westinghouse Electric Corp. - - Pittsburgh, Penna.

FIBERGLASS SCHOOL SHOP PROJECTS

Plant stand, tray, candy dishes and fruit and plant bowls were made of fiberglass by seventh and eighth grade students. The rectangular table is a combination of paper honeycomb, fiberglass-Castoglas and metal legs. It is light yet strong.

THE SERIES OF ARTICLES that Alexander F. Bick of the Milwaukee schools wrote for Industrial Arts and Vocational Education magazine has created a great deal of interest among industrial arts teachers.

Major emphasis was placed on the laminating technique with cold setting resins and fiberglass fabrics. It described the simplicity of the process which enables seventh and eighth grade students to produce the bowls and tables illustrated above.

Why Are These New Materials of Such Value to Schools?

Foremost is the ease with which they can be worked by a simple hand lay-up method. This makes them especially suitable for class work, even in the smallest shops. The method of forming a small candy dish is much the same as the technique employed in building a 14-foot speed boat. Fiberglass fabrics are impregnated with liquid resins for such varied school projects as bowls, lamps, tables, chairs, decorative panels, suitcases, radio housings, safety guards, trays, storage tanks, boats, sport cars, to name only a few.

There is a logical tie-in with the Art. Department. The fabric designs in the two bowls and the tray shown in the photograph above were transferred to the glass cloth by silk screen printing.

These 8th grade students are making the mold for a fiberglass chair.

No Heat or Pressure Required

It's downright uncanny, to say the least, that these versatile materials can be formed into almost any shape without heat or pressure. Tanks, trays and similar forms of special shape or size can be made of fiberglass in a matter of hours and at little cost compared to custom made metal containers. A mold may be made of clay, plaster, wood, meshed wire or similar conventional materials that are inexpensive, easily worked and readily available. The fiberglass fabric is molded over this form and impregnated with resin which is just brushed or rolled on. It will harden within one hour at room temperature and can then be removed from the mold.

Lightweight Laminate Will Not Rust Nor Corrode

Thickness for thickness, fiberglass laminates are as light as aluminum and as hard as steel, yet resilient. The favorable light weight to strength ratio is not the only desirable characteristic of fiberglass. Unlike conventional materials, it will not rust, corrode or crack and is unaffected by acids, alcohol, oil, grease, hot or cold water and extreme temperature changes. Considering all these factors, it is not surprising then that fiberglass and laminating resins have become of considerable importance in industry.

FIBERGLASS CLASS PROJECT KIT

In addition to 9 lbs. of Castoglas laminating resin (approx. 1 gallon), this Class Project Kit contains several yards of fiberglass fabric, glass tape, experimental quantities of mat and honeycomb. Five different pigments are also included and sufficient quantities of Thinner, Cleaner, fillers and other supplies needed to make a series of projects in which the entire class can participate.

FIBERGLASS CLASS PROJECT KIT (F.O.B. Woodstock) Cat. No. GS-2..... $25.00

How to Get Started

With the school instruction folder you will receive a complete material list with prices of all chemicals and supplies. It is simple to order from this list when you are acquainted with the exact function of each product. However, to get started without delay, the easiest way is to begin with the Fiberglass Class Project Kit. Authorized purchases are shipped on open account. If you prefer to order on your own account, to be paid for by the students, your check with order will be appreciated.

FREE INSTRUCTION FOLDER

Do you want more facts before requisitioning any material? The shop instruction folder described in the adjoining column is free to all teachers of Industrial Arts Departments. *Write to School Dept. K-50.*

THE CASTOLITE COMPANY, Woodstock, Illinois

● Producers and Distributors of Casting, Laminating, Coating and Molding Resins. Serving Industry, Science, the Arts and Crafts.

TEACHING MATERIALS

(Continued from page 244)

Southern Pine Association
Canal Building
New Orleans 4, Louisiana

Sound-slide film: The Inside Story of a Good Home, Requires standard 35mm., slide film projector. Narration is on 16" record.

Unit Ventilator Department
American Air Filter Company, Inc.
215 Central Avenue
Louisville 8, Kentucky

Design for Learning, 16mm. color sound

West Coast Lumbermen's Association
1410 S.W. Morrison Street
Portland 5, Oregon

Lumber for Homes, 16mm. sound, color motion picture

Western Pine Association
510 Yeon Building
Portland 4, Oregon

Building a Home with Western Pines, 16mm. sound on film
Fabricating the Western Pines, 16mm. sound on film

Wood Conversion Company
First National Bank Building
Saint Paul 1, Minnesota

Happy House, 16mm. sound
Nu-Wood Tile Application, strip film
Balsam-Wool Insulation Application, strip film

Advertising Manager
Youngstown Kitchens
Warren, Ohio

Your Youngstown Kitchen, — So Easy to Own, color sound

ELECTRICITY AND COMMUNICATIONS — BULLETINS AND BOOKLETS

Accident Prevention Department
Association of Casualty and Surety Companies
60 John Street
New York 38, New York

I-39 Your Guide to the Safe Installations of TV Receivers

American Telephone and Telegraph Company
195 Broadway
New York 7, New York

Telephone Almanac for 1954
The Magic of Communication
Alexander Graham Bell
The Telephone in America

Better Light Better Sight Bureau
420 Lexington Avenue
New York 17, New York

Teaching Aids and Projects in the Field of Lighting

Breuer Electric Mfg. Company
5100 North Ravenswood Avenue
Chicago 40, Illinois

Descriptive Catalogs

National Carbon Company
A Division of Union Carbide and Carbon Corporation
30 East Forty-Second Street
New York 17, New York

General Product Catalogue, S-5005
Cathodic Protection Catalogue, S-6500
Electrode Tip Bulletins, Numbers 1–9
Modern Pyramid Bulletins, Numbers 1–13 (Deal with brushes & commutation)
Diesel-Electro Carbon Brushes, Numbers 1–9
Inside Story of Dry Batteries
Manual of Cooling Systems Service

Edison Incorporated, Thomas A.,
Edison Storage Battery Division
West Orange, New Jersey

Edison and His Storage Battery
Storage Batteries in Industry

Electric Storage Battery Company
P. O. Box 8109
Philadelphia 2, Pennsylvania

Parts and Assembly of a Lead Type Storage Battery
Storage Batteries and The Services for Which They are Used
The Storage Battery, Its Fundamentals, Use and Maintenance
Facts and Fallacies About the Weather

Electronic Instrument Company, Inc.
84 Withers Street
Brooklyn 11, New York

Kits Instruments

General Electric Company
One River Road
Schenectady 5, New York

Why Study Math? (PRD-1)
Math at General Electric (PRD-9)
Why Study English? (PRD-14)
Engineering Tomorrow (APG-220A)
Highlights of 1953 (PRG-29)
Scrapbook History (APF-73)
Edison and Electricity (APD-53)
Thunderbolts in Harness (APD-62A)
Steinmetz: Latter-Day Vulcan (APD-67)
The Romance of Electricity (APD-72)
Project Circus (APD-119)
Motors Make the World go Round (APD-79)
Man-Made Magic (PRD-7)
Electricity Around Us (APG-17A)
Network of Power (APG-17-1A)
X-Rays in Medicine, Industry, and Science (APG-17-3)

(Continued on page 24A)

CHALLENGE WORK BENCHES

2" cast-iron top, heavy channel steel legs mean less wear, less maintenance. Provides "natural, left-handed lighting" and "front-to-back" classroom efficiency. 16 models, with 4 or 6 legs. Shelf, drawer, wheels optional.

LAYOUT SURFACE PLATES

Special analysis semi-steel plates, precision ground or planer finished for accuracy in layouts and assemblies.

Semi-Steel BENCH PLATES

In a wide range of planer finish or precision ground surfaces of 2" and 4" thickness. Steel stand optional.

CHALLENGE PAPER CUTTERS

Styles for every shop. Including lever cutters in bench and floor models . . . hand-clamp power cutters . . . and full-hydraulic models. Each with features that have made Challenge first in Cutting!

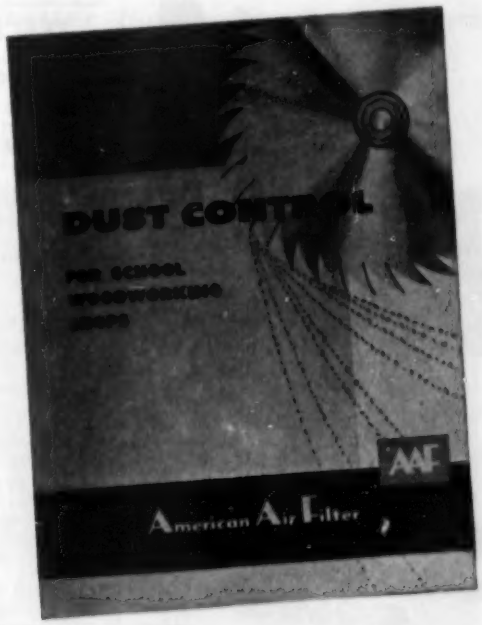
792

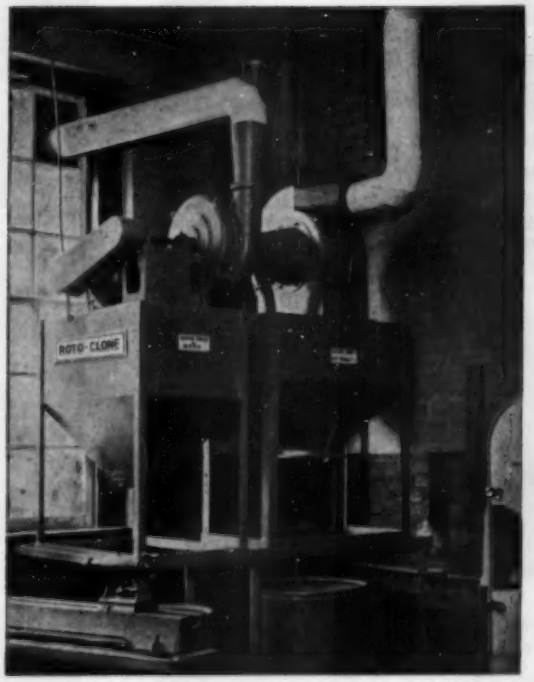
THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN

Challenge®

YOU ASKED . .

6000 teachers and officials requested this dust control bulletin during the past year.





. . YOU ACTED

More school woodworking shops installed AAF Dust Control during the first 6 months of 1955 than in the 3 previous years combined.

AIR free of dust—floors no longer littered with chips and shavings! Utopia? Not a bit—it's typical of scores of school woodworking shops equipped with AAF Dust Control Equipment.

The bulletin tells the story—describes the two AAF Units most widely used for this service; contains engineering data on a typical school exhaust system. It shows you why these units require little space—how they store the collected material for later disposal.

Write today for your free copy! And remember—AAF Dust Control Equipment is equally practical for modernization or new construction projects.

COUPON

Please send me Bulletin No. 272-E1 describing AAF Dust Control Equipment for Woodworking Shops.

Name_____

School_____

City_____ State_____

AAF
herman nelson

American Air Filter
COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 203 Central Avenue, Louisville 8, Ky.

Cut Your Saw Blade Bill with SIMONDS SI-CLONE SAWS

You save 3 ways with Simonds Si-Clone Saws. First of all, you get a high quality, electric furnace alloy steel saw at popular price. Second, you get longer service between sharpenings because Simonds steel holds a keen edge longer. And finally, you get smoother, straighter cuts that need less finishing, save time, mean better work.

What's more, you have a choice of 13 types of saws up to 12" diameter for specific cutting needs, for use on all standard table, radial arm or portable electric hand saw machines.

Get these money-saving saw blades from your hardware or mill supply dealer . . . send for Catalog "B".

Rip, Cut-off and No. 60 Comb.

6"	$1.75
7"	2.00
8"	2.15
9"	2.65
10"	3.15
12"	4.35

Supplied with round or special shape holes

GUARANTEE
Made of Simonds steel fully guaranteed against any defect in material or workmanship.

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Factory branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que.

TEACHING MATERIALS

(Continued from page 22A)

Electricity in Railroading (APG-17-4)
The Story of Light (APG-17-7)
A Story of Electronics (APG-17-8)
Adventures Inside the Atom (APG-17-5)
Adventures in Jet Power (APG-17-2A)
Adventure into The Past (APG-17-6)
Land of Plenty (APG-17-11)
Adventure into The Future (APG-17-10)
News Digest
Photo News

General Electric Company
Lamp Division
Nela Park
Cleveland 12, Ohio

Safety Lighting Service

General Lighting Company
248 McKibbin Street
Brooklyn 6, New York

New Forms in Accent Lights
New Forms in Linear Lighting
General Color Catalog
Chandelier Catalog
Custom Decorative Lighting Fixtures

General Motors
Educational Relations Section
Department of Public Relations
Detroit 2, Michigan

A To Zero of Refrigeration
Electricity and Wheels
Optics and Wheels
Power Goes to Work

General Motors
Guide Lamp Division
Detroit 2, Michigan

Aim to Please
The Autronic Eye
Guide Automotive Lighting Service Manual

General Radio Company
275 Massachusetts Avenue
Cambridge 39, Massachusetts

Sound General Radio Instruments for Its Measurement
Stroboscopes
Variac Theatre Dimmer Controls
Portable Stage-Lighting Control
Stage Lighting With Variacs
New Variacs For Increased Performance

Gyroscope Company, Sperry
Division of the Sperry Corporation
Great Neck, New York

Elmer's Gyros
The Gyroscope Through The Ages

National Adequate Wiring Bureau
155 East 44th Street
New York 17, New York

Facts About Electric Wiring For the Home
L-1 Layout Sheet, 4¢ per copy
L-2 Furniture Cutout Sheet, 3¢ per copy
Handbook of Residential Wiring Design, 25¢ per copy
For Better Living Your Home Needs Adequate Wiring, 4¢ per copy
Check Your Wiring, 5¢ per copy
Getting the Most From Your Home's Electric System, 15¢ per copy
Electric Wiring Its Relationship to Modern Homemaking

Onan & Sons, Inc., D. W.
25th Street, S.E. at University Avenue
Minneapolis, Minnesota

Electrical Definitions, Formulas and Symbols, (T-006)
Electric Motors Used With Electric Generating Plants (T-009)

(Continued on page 26A)

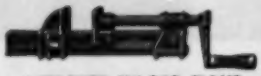
HARGRAVE CLAMPS
The Complete Line for SCHOOL
"Load Tested"

SPRING CLAMP

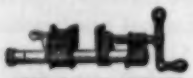
SUPER JUNIOR CLAMP

STANDARD CARRIAGE CLAMP

QUICK CLAMP



IMPROVED "I" BAR CLAMP



PIPE CLAMP FIXTURE

The complete line of Clamps for every School application. Designed and marketed for Industrial use.

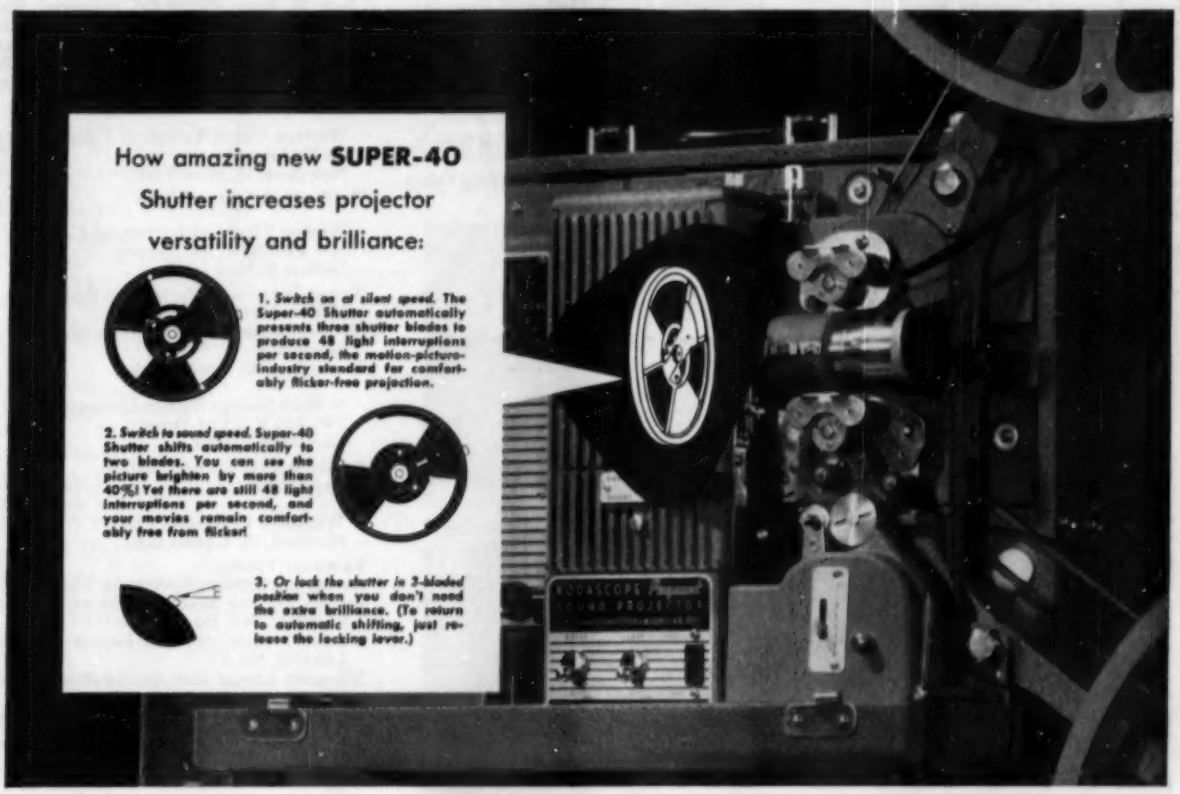
Ask your local Distributor for a copy of the new No. 65 HARGRAVE Catalog or write—

The Cincinnati Tool Co.
Waverly & Main
CINCINNATI 12, OHIO

HARGRAVE
The Complete Line of Tested TOOLS

new—

Kodak shutter development combines sound-and-silent versatility with 40% extra screen brilliance!


How amazing new SUPER-40
Shutter increases projector
versatility and brilliance:
1. Switch on at silent speed. The Super-40 Shutter automatically presents three shutter blades to produce 48 light interruptions per second, the motion-picture-industry standard for comfortably flicker-free projection.
2. Switch to sound speed. Super-40 Shutter shifts automatically to two blades. You can see the picture brighten by more than 40%! Yet there are still 48 light interruptions per second, and your movies remain comfortably free from flicker!
3. Or lock the shutter in 3-bladed position when you don't need the extra brilliance. (To return to automatic shifting, just release the locking lever.)

Now in Pageant A-V models without extra cost . . .

Kodak's amazing new SUPER-40 Shutter

Kodascope Pageant Sound Projectors have long been respected as outstanding in all 16mm. sound projection's most important characteristics. Exclusive permanent pre-lubrication, for example, makes Pageants the easiest of all projectors to maintain, the surest to use, and the most permanently quiet in operation. And there are other features, like the unique sound-focusing Fidelity Control and the built-in field-sharpening element, that make Pageants outstanding in sound and picture quality, too.

Now, with the Super-40 Shutter, there's still another basis of Pageant superiority. This amazing shutter provides *more than 40% extra illumination* at sound-speed operation; yet thanks to its automatic-shift feature, movies are comfortably free from flicker at both sound and silent speeds.

Pageant Sound Projectors, more than ever, merit top recommendation, because Pageants have now achieved a versatility of performance never before approached in 16mm. projection! The Super-40 Shutter equips Pageant A-V Model Projectors for both sound and silent operation . . . makes them capable of projection not only under "normal" conditions, but also under difficult conditions of illumination, in hard-to-darken rooms, in large halls—wherever additional brilliance, extra-long "throws," or unusually large images are required!

The Super-40 Shutter is supplied without extra cost in any of three new Kodascope Pageant Sound Projector models of varying amplifier output and speaker capacity. See your Kodak Audio-Visual Dealer for full details . . . or just mail the coupon for a new free Pageant Projector catalog.

EASTMAN KODAK COMPANY, Dept. 8-V, Rochester 4, N. Y.

9-103

Please send catalog on new Pageant Projectors with Super-40 Shutters.

NAME_____

TITLE_____

ORGANIZATION_____

STREET_____

CITY_____ (Zone) STATE_____

Kodak

TEACHING MATERIALS

(Continued from page 24A)

Power Factor (T-004)
Stand-By Electric Generating Plants and Type AF and LT Line Transfer Controls (T-011B)

Radio Receptor Company, Inc.
Sales Department
251 W. 19th Street
New York 11, New York

Radio Catalog

Sams and Company, Inc., Howard W.
2201 East 46th Street
Indianapolis 5, Indiana

Book List
Planning Guide For Instructors in Radio Television Electricity
Photofact Folders on Latest Circuits
How to Understand and Use TV Test Instruments
Photofact Television Course
Analyzing and Tracing TV Circuits
Practical Training Manual, Radio Series Volume I, Basic Radio

Shallcross Manufacturing Company
Collingdale, Pennsylvania

Shallcross Catalog of Resistors, Instruments, Switches and Attenuators

Standard Electric Time Company, The
89 Logan Street
Springfield, Massachusetts

Flexlab For Vocational and Technical Schools

United States Government Printing Office
Division of Public Documents
Washington 25, D. C.

Radio and Television Bibliography, 1952, 25¢
Catalog No. FS 5.3: 952/18
Audio-Visual Education, Television in our Schools, 1953, Catalog No. FS 5.3: 952/16

Universal Scientific Company, Inc.
1102 Shelby Street
Vincennes, Indiana

Teaching Aids and Text-Manuals for Instruction in Basic Electricity, Advanced Electricity, Elementary Electronics, Rotating Electric Machines, (DC and AC motors and Generators) Radios Transmitting and Receiving Principles, Electro Statics, High Potential and High Frequency Currents

Western Union Telegraph Company, The
60 Hudson Street
New York 13, New York

The Story of Western Union

Weston Electrical Instrument Corp.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Weston Instrument Mechanisms Permanent-Magnet Moving-Coil Type
Electrical Instruments for Instruction and Research
The Instrument Sketch Book

Willard Storage Battery Company
246–286 E. 131st Street
Cleveland 1, Ohio

AABM Battery Service Manual
Battery Catalogue

Wiremold Company, The
Hartford 10, Connecticut

Raceways Fittings
Wiring and Lighting Systems by Wiremold
Factory Lighting Modernization with No. 2100 Plugmold, No. D4
Wiremold 21SW Slimline Layout For Cove Lighting, No. C5
Wiremold Layout For Air Conditioning Unit Circuits, No. C4
No. 2000 Raceway Provides Functional Wiring for Television Display Room, No. B8
Plugmold 2000 and Wiremold 3000 House Intricate Wiring in High Fidelity Studio, No. B9
Wiremold For Wiring Louvered Ceiling Lighting Installation, No. B7
Wiremold 2100 Layout for Blackboard Lighting, No. A7
Wiremold 3000 and 2100 Installation for Room Air Conditioners, No. A8
Wiremold 3000 Layout For Infra Red Oven, No. D5
Complete Electrical and Telephone Modernization Job With 2100 and 3000 Wiremold, No. D6
Plugmold 2000 Multi-Outlet System for Six-Room House, No. E5
Plugmold 2000 Multi-Outlet System Installation with a Variety of Construction Details, No. E6
Plugmold 2000 Multi-Outlet System for Contemporary Houses, No. E7
10 Typical Construction Details Showing Plugmold 2000 Installed in Residences, No. E8
Plugmold 2000 Multi-Outlet System for Six-Room Colonial House, No. E9
Plugmold Installations on Work Tables for Small Motors, Work Lights, etc., No. F9
Wiremold 1500 Pancake Layout For Drafting Room, No. H6
Typical Telephone Installation Using No. 1500 Pancake, No. H4
2100 and 3000 Wiremold Outlet Systems for Movable Partitions, No. F14
Wiremold 3000 Multi-Outlet System for Test Rack, No. F13
Wiremold 3000 Multi-Outlet System for Radio Repair Shop, No. F12
Wiremold 3000 Multi-Outlet System for Electric Shop, F11

In the school shop as in industry, this rugged Logan "6560" performs impressively on every operation. On heaviest cuts, or at maximum speed, it turns the work *smoothly*, quietly, with precision results. Superior performance is designed, engineered and built into it.

The Variable Speed Drive provides instant spindle speed correction. The oversize spindle, with 1⅝" bore, turns on a ball bearing mounting that needs no adjustment within the full range of 38 to 1200 rpm. The bed is a wide, deep special alloy casting, extra heavy and resistant to both internal and external stresses. The two V-ways and two flat ways are precision ground. Extra strength and weight throughout, plus dynamic balancing of the complete lathe practically eliminates vibration. Moderate price and low cost operation make the "6560" outstanding in economy as well as in precision performance. Write for Bulletin 14-L, giving a full description.

SPECIFICATIONS AND FEATURES

14½" swing over bed
9" swing over saddle
1⅝" spindle hole
1" collet capacity
40" between centers

Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm
Two-V-way, Two-flat way, Precision Ground Bed
Precision Carriage

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Lawrence and Lemon Ave., Chicago 30, Ill.

Wiremold Layout For Fire Alarm System, No. R-2
For Plug-In-Anywhere Outlet Convenience
Wiremold One-Piece Surface Metal Raceway Systems
Wiremold Pancake Overfloor Wiring Systems for Light, Power, and Communications Circuits
Plugmold 2000 by Wiremold
Fluorescent Lighting Fixtures and Fittings For General and Supplementary Lighting

ELECTRICITY AND COMMUNICATIONS — CHARTS AND SAMPLES

General Electric Company
One River Road
Schenectady 5, New York

Things I've Been Thinking About (APD-66)
The Story of General Electric Research (APD-71)
Story of the Turbine (APD-68)

Electric Storage Battery Company, The
42 South 15th Street
Philadelphia 2, Pennsylvania

Exide Batteries and the Services For Which They Are Used
Parts and Assembly of a Lead Type Storage Battery

General Motors
Guide Lamp Division
Detroit 2, Michigan

Headlight Aiming Screen Kit, no charge

Lipscomb Associates, Earl
P. O. Box 7084
Dallas 9, Texas

Instrument Directory

Ohmite Manufacturing Company
3601 Howard Street
Skokie, Illinois

OHM'S Law Calculator (cardboard type), 25¢ each
Little Devil, color coder, 10¢ each

Superintendent of Documents
U. S. Government Printing Office
Washington 25, D. C.

Safe Practices Around Electrical Equipment, 5¢
Safe Practices in Use and Maintenance of Low Voltage Electrical Equipment, 10¢

Wiremold Company, The
Hartford, Connecticut

Wiremold Surface Metal Raceways and Fittings
Wiremold Reference Chart

ELECTRICITY AND COMMUNICATIONS — FILM MATERIALS

Du Pont De Nemours and Company, Inc., E. I.
Wilmington 98, Delaware

And to Fame Unknown, 16mm. black and white sound film

Edison, Incorporated, Thomas A.
Edison Storage Battery Division
West Orange, New Jersey

Storage Battery Power, 16mm. sound motion picture

General Motors
Guide Lamp Division
Detroit 2, Michigan

Aim to Please, for loan

General Motors Corporation
Educational Relations
Public Relations Department
Detroit 2, Michigan
(send inquiries regarding material from all GM divisions to above)

Better Ignition, slide film
Electrical Service, slide film
Heavy Duty Generator Regulators, slide film
Standard Duty Generator Regulators, slide film

GENERAL MOTORS CORPORATION

Request from the western states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming should be addressed to:

General Motors Corp.
508 San Francisco Bank Building
405 Montgomery Street
San Francisco 4, California

Exhibitors in Greater New York and on Long Island should write to:

General Motors Corp.
Department of Public Relations Film Section
1775 Broadway
New York 19, New York

All other states, including that part of New York State not mentioned above, are served by:

General Motors Corp.
Department of Public Relations Film Section
General Motors Building
Detroit 2, Michigan

Magic in the Air, sound motion picture, 16mm.
On To Jupiter, sound motion picture, 16mm.
Harnessed Lighting, sound motion picture in color, 16mm.

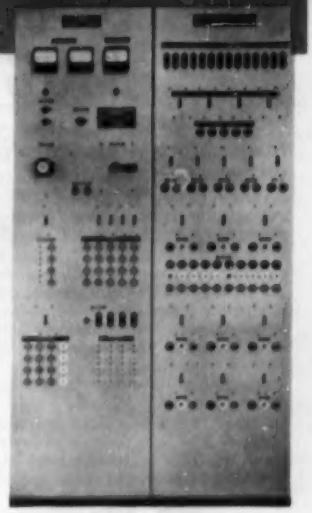
Merchandising Division
Minneapolis-Honeywell Regulator Company

(Continued on next page)

Let's Talk Shop...

WHAT ARE YOUR HIGH SCHOOL SHOP'S ELECTRICAL REQUIREMENTS?

If you are planning a new shop or revamping your present one . . . for valuable suggestions, a shop layout plan, a list of fundamental requirements ...Send for Booklet #205 "Electrical Requirements for H. S. Electric Shops" (Industrial Arts level); Booklet #216 (Vocational & Technical School level).



SAFE, TIMESAVING, UP-TO-THE-MINUTE EQUIPMENT

SERVICE UNIT
Typical bench unit for 2- or 3-wire variable service, 120V a-c and continuity test circuit. Single or double faced. Many other types.

CONNECTOR CORDS
Other types furnished to meet requirements.

MOTOR GENERATOR
A typical machine for furnishing 125V d-c. Furnished in any size required.

DISTRIBUTION SWITCHBOARD
This controls and distributes all the various a-c and d-c currents required for any work in the Electric Shop.

SINCE STANDARD electric 1884

THE STANDARD ELECTRIC TIME COMPANY
127 Logan St., Springfield 2, Mass.

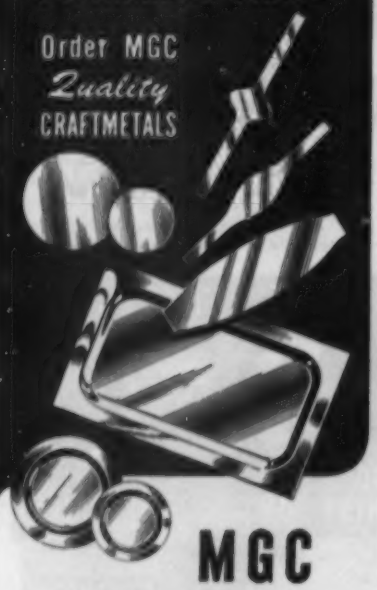
Please send me Booklet No. 205 ☐
Please send me Booklet No. 216 ☐ Check

NAME.....
TITLE.....
SCHOOL.....
CITY.....STATE.....

THE STANDARD ELECTRIC TIME COMPANY
127 Logan Street • Springfield 2, Massachusetts

Help Your Student
"DO HIMSELF PROUD"

Order MGC
Quality
CRAFTMETALS



MGC

means a better start towards a superior result!

When Metal Goods Corporation's *Super - Brite MIRROR - Finish Aluminum*, and other specially-prepared craftmetals are supplied, your students are given their best chances of noteworthy achievement. But don't take our word for it—investigate the possibilities of these finer craftmetals in connection with your teaching. Mail the coupon for a free copy of our instruction booklet and metal price list. We think you'll be pleasantly surprised to learn how inexpensive it is to give every student the benefit of the best in his metalcraft projects.

SAFE-T-ETCH
NON-ACID ETCHING COMPOUND
a boon to the craft instructor

Especially suited to class work, because it eliminates the hazards and objectionable features of acids, our new non-acid etching compound, SAFE-T-ETCH, is a safer . . . faster . . . easier way of etching aluminum. Regardless of the particular phase of metal-crafting in which you are interested, M G C can supply the proper blanks and shapes — ready for crafting in aluminum, brass, copper and stainless steel. Mail the coupon now and get full information. No obligation, of course.

Send Coupon for
Free INSTRUCTION BOOKLET,
METAL PRICE LIST

METAL GOODS CORPORATION

Craft Division S
METAL GOODS CORPORATION
3247 Brown Ave., St. Louis 15, Mo.

(Please type or print)

NAME_____

ADDRESS_____

CITY_____ ZONE ___ STATE_____

TEACHING MATERIALS

(Continued from previous page)

Minneapolis 8, Minnesota
Basic Electricity, 16mm. sound color

Modern Talking Picture Service Film Libraries are located at:
Atlanta 3, Georgia – 247 Spring St., S.W.
Boston 16, Mass. – 235 Stuart Street
Buffalo 2, N. Y. – 122 W. Chippewa St.
Cedar Rapids, Iowa – 720 Third Ave., S.E.
Charlotte 6, N. C. – 501 No. College St.
Chicago 11, Illinois – 140 East Ontario St.
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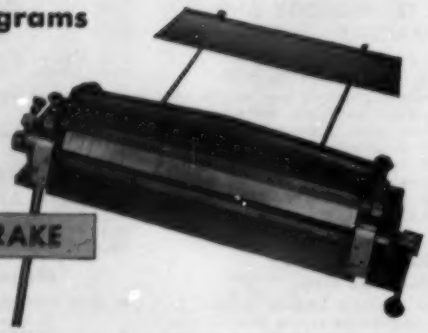

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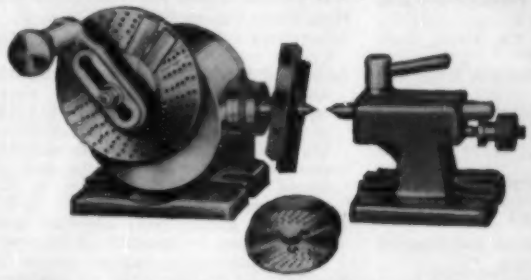

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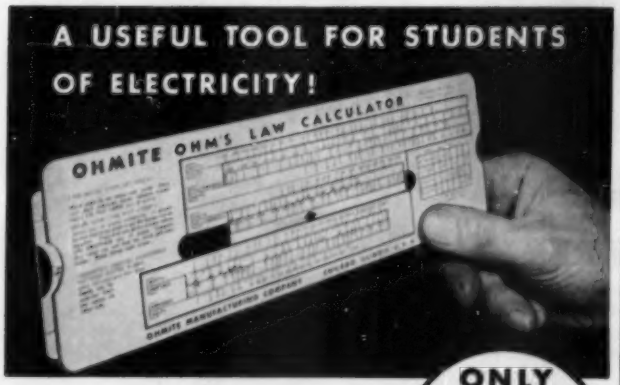

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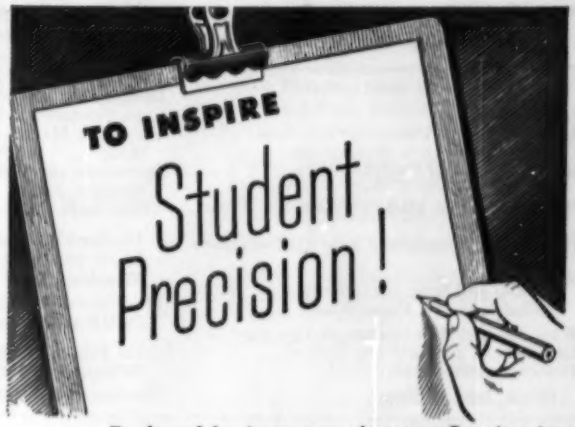

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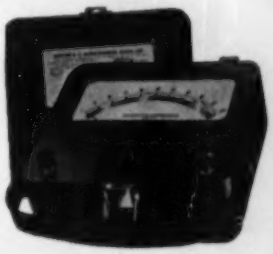

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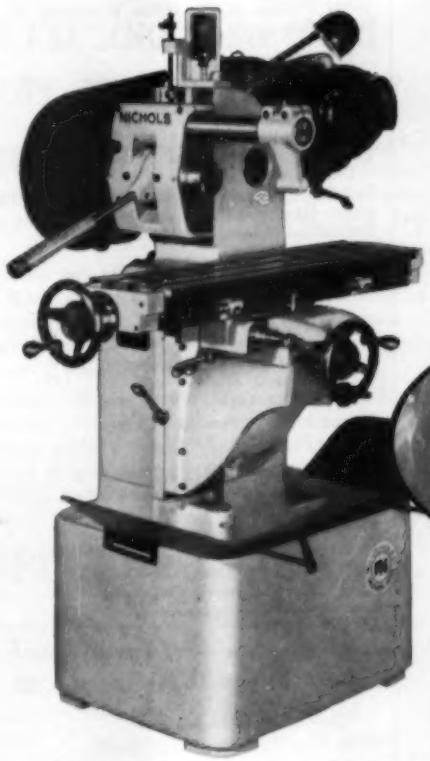

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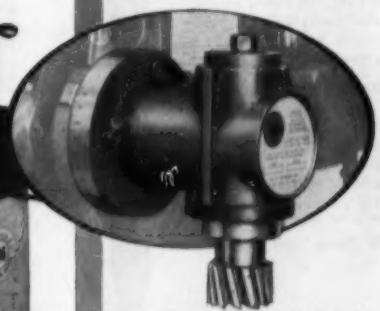

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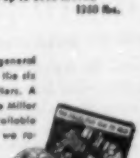

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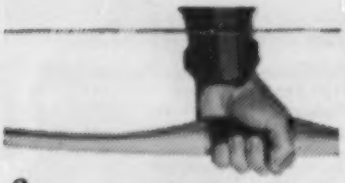

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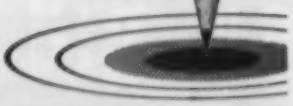

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Exhibitors in Greater New York and on Long Island should write to:

General Motors Corp.
Department of Public Relations Film Section
1775 Broadway
New York 19, New York

All other states, including that part of

(Continued on page 36A)

Teacher's pet . . .

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UNIVERSAL® IRON BENDER

Wrenchless Type — Model #1
Bends Flat, Round, Bar, Angle, Pipe

Samples of Bar Bending

HUNDREDS of shop instructors in vocational training departments of schools and municipal, state and government institutions are sold on the merit and utility of the Hossfeld Bender. Their maintenance departments, too, recognize it as practical and indispensable in the shop as a bench vise, capable of replacing a half dozen special machines. Proved in thousands of factories and repair shops as well, the Hossfeld Bender will neatly, quickly and accurately teach your students the 101 different bending jobs that they will be called on to perform in repair, maintenance and production work. For a better bender — specify **Hossfeld**.

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#1 Bending Capacities
Standard Pipe & Conduit — up to 1½" I.D.
Heavy Bends, Direct on Center Pin; "U" Bends on Cam Dies, 3" x 7/16" Flat or ⅞" Round or Square Cold
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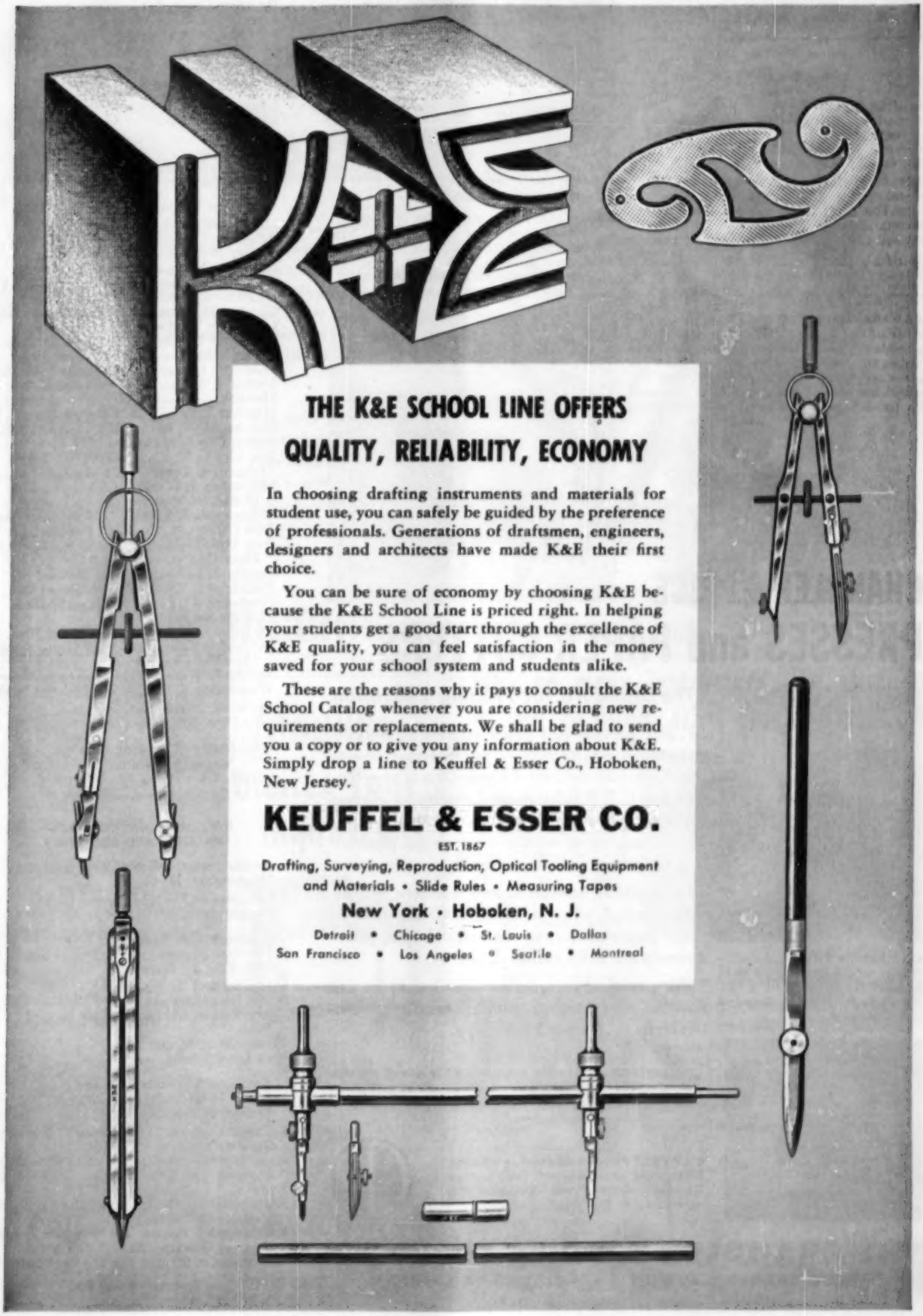

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(Continued from page 34A)

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Kenwood Mills
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Paper, Pacemaker of Progress, 16mm. sound color

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Denver 9, Colorado – 583 South York St.
Detroit 1, Mich. – 4754 Woodward Ave.
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Houston 2, Texas – 2610 Fannin Street
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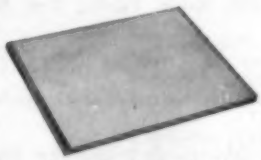

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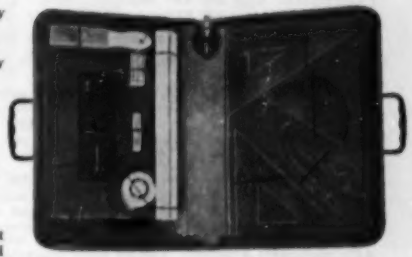
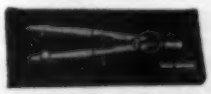
Tell your students about the Berger Kit — and tell us how many you need. It costs so little — less than buying the items individually.



PATENT PENDING



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(Continued from page 36A)

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(Continued on page 40A)

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MASTER-MONOTROL*
10-INCH TILTING ARBOR SAW
• CUTS A BOARD PLUMB SQUARE!
• RIPS SUPER STRAIGHT!
• CUTS MITERS THAT REALLY FIT!

33⅓% TO 50% MORE POWER

Horsepower, enough power to cut full 3" hardwood was usually available only in 12-inch saws. In a Master-Monotrol* you have a selection of motors offering from a third to a half more power than others accommodating only small frame motors. Boice-Crane full powering guarantees freer sawing, reduced hazard of accidental kickbacks when freeing stock from a choked blade. The Master-Monotrol is the only 10-inch saw that goes up to 2 H.P.

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ARBOR SPEED: 4000 r.p.m.'s
CAPACITY: Cuts off 15" wide, 1" thick
Cuts off 13⅛" wide, 3" thick
Rips to center of 6 ft. wide stock
POWER: To 2 H.P. 3-ph., to 1½ H.P. 1-ph.
ARBOR: ⅝" dia.
TABLE SIZE: 36" wide x 27½" long with extensions

MEETS EVERY DEMAND FOR CAPACITY, LONG LIFE, STURDINESS

Produces Superior Cabinet Work. Guarantees Permanent Accuracy, even with abusive use.

EXCLUSIVE NEW TYPE TRUNNION

All critical parts, support surfaces, bearings and contacts are oversize, extra rugged. Many parts actually equal in size to those on 12-in. saws.

SINGLE CONTROL FOR POSITIONING BLADE

New Monotrol* saw blade positioning system reduces blade controls to a single large handwheel, plus a height lock and a tilt lock, all mounted on the front — equally convenient for right-handed or left-handed operators! No groping, no out-of-reach controls, fewer accidents, an amazing saving of time on variety work. 5% to 29% faster blade speed. Cuts faster, cleaner, smoother. Up to 44% more ripping capacity without extra attachments.

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Overhung arbor pulley for quick belt changing and without tools • Power-packed 3 V-belt drive and larger pulleys • Start-stop switch which accidental manipulation can turn only "OFF," never "ON" • Blade tilt to left — the safest way for right-handed operators • Steel, all-purpose insert serves saw blades, and dado heads as well without constant interchange, and without extra cost • Ground cast-iron fence with entirely new micro-control, and easier fool-proof adjustments • 37 inches maximum fence to blade, 44% more ripping capacity than most 10-inch saws..

Now, there really IS a new and BIG difference in saws.

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932 Central Avenue — Toledo 6, Ohio

Please send complete details on the Master-Monotrol.*

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SCHOOL.....
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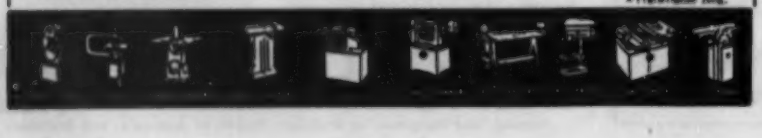

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EAGLE * TURQUOISE

with 100% *"Electronic" Graphite

SEND FOR FREE SAMPLES

Just drop us a note, naming the degrees you desire and the dealer who supplies you.

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TEACHING MATERIALS

(Continued from page 38A)

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Apartment House Safety Instructions, No. I-5
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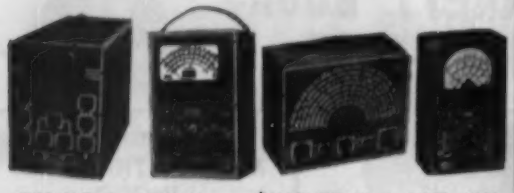

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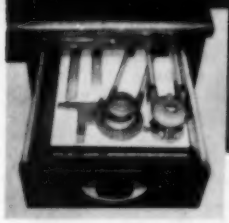

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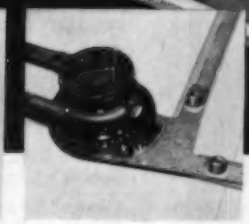

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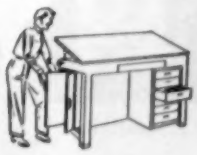

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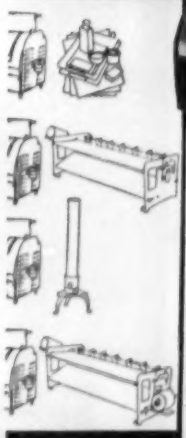

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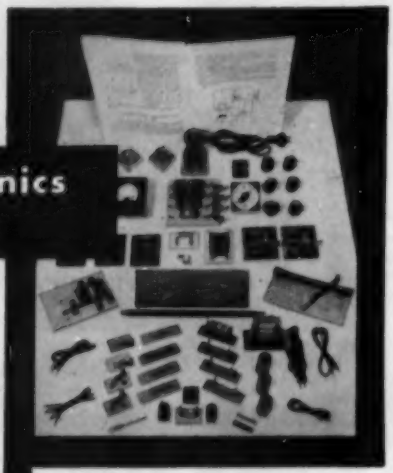

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Ventomatic Air Control Valves — for improving the efficiency of Dust Collectors and Dust Systems.

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Master Aluminum Melting Furnaces — 50 and 100 lb. capacities.

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has proven to be of top quality in the School Shop. Nothing takes the place of experience. Paxton has been serving the schools satisfactorily for 40 years. You can depend upon Paxtons!

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THE JOHNSON No. 706

Teach a wider range of hardening, tempering and annealing with the Johnson No. 706. Six powerful direct jet burners deliver easily controlled temperatures from 300° to 1850° F. Uses natural, artificial, mixed, or bottled gas. Economical in operation. Fire box 7 x 13 x 16½ inches.

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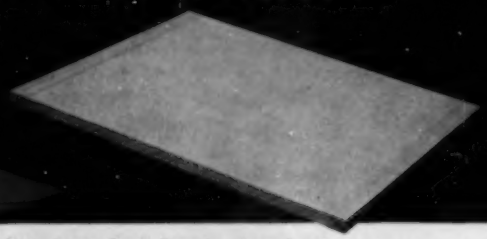
POST

POST DRAWING BOARDS

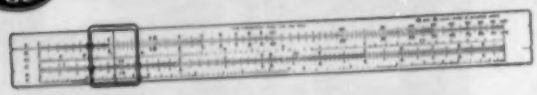


This new student drawing board achieves economy at no sacrifice in working quality. Ask for No. 7253. POST drawing boards are remarkable values. Made of first quality, selected basswood in range of all standard sizes.

REMINDER CHECK LIST for drawing board items:

- ☐ Light-weight Boards
- ☐ Drawing Stands
- ☐ Drawing Outfits
- ☐ Drawing Kits

POST LAMINATED BAMBOO SLIDE RULES



From pocket size to the famous Versalog, POST slide-rules are exact mathematical tools. Their laminated bamboo construction assures a lifetime of trouble-free accurate service. Each has deep-cut precise graduations on snow-white celluloid faces. New instruction booklet.

REMINDER CHECK LIST for slide rule items:

- ☐ Versalog
- ☐ Circular Slide Rules
- ☐ Pocket Slide Rules
- ☐ Slide Rule Magnifiers

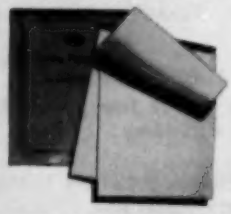
HAND-CRAFTED DRAWING INSTRUMENTS

All POST drawing instruments are hand-crafted in POST factories according to rigid standards that insure a lifetime of service. POST Custom-Master sets are specially selected combinations, custom fitted to suit a wide variety of modern drafting requirements. Each combination is built around a perfectly weighted and balanced 6¾ inch Big Bow Combination Compass, equipped with interchangeable attachments. No. 752M is shown in the new pocket-size "Perma-Case." Other Custom-Master Combinations are available in standard two-flap cases. Post also has a full selection of traditional 3 Bow sets.

REMINDER CHECK LIST for other instruments:

- ☐ Ruling Pens
- ☐ Compasses
- ☐ Beam Compass Sets
- ☐ Dividers

POST DRAWING AND TRACING PAPERS



POST drawing and tracing papers are of highest quality, with an assortment that fills every need. Wide variety of rolls, pads, or sheets in every price range.

REMINDER CHECK LIST for other paper items:

- ☐ Cross-section Papers
- ☐ Drawing Envelopes
- ☐ Sketching Pads
- ☐ Artist Board

supplies now!

IMMEDIATE DELIVERY ★ COMPLETE LINE

POST SCALES BUILT FOR ACCURACY

POST scales are built for accuracy and longer life. There's a wide range of scale combinations, for student or engineer. Printed or engine-divided. Triangular and flat, with full or open divided graduations.

REMINDER CHECK LIST for scales and other items:

- ☐ Pocket Scales
- ☐ Templates
- ☐ Tapes of all types
- ☐ Lettering Guides

POST COMPLETE RANGE OF TRIANGLES

Ask about POST triangles, made of finest transparent materials. Complete range of standard sizes, with or without finger lifts.

REMINDER CHECK LIST for other transparent items:

- ☐ Curves
- ☐ Protractors
- ☐ Adjustable Triangles
- ☐ Combination Curves

POST FAMOUS WATERPROOF INKS

POST drawing inks are first choice with draftsmen and engineers. Dependable waterproof inks in a complete range of colors. These are jet black, white, brilliant blue, green, yellow, brown, scarlet, vermillion, brick red, orange, violet, carmine and indigo.

REMINDER CHECK LIST for other sundries:

- ☐ Pencils
- ☐ Dusting Brushes
- ☐ Pencil Pointers
- ☐ Erasers and Shields

POST POST T-SQUARES

The same care that makes POST drawing boards the finest available is also used in making POST T-squares and straight edges. With plain or transparent edge in all standard sizes.

REMINDER CHECK LIST for other drafting materials:

- ☐ Blackboard Sets
- ☐ Straight Edges
- ☐ Student Drafting Machine
- ☐ Steel T-Squares

Check your POST Annual School Specials folder for detailed listings and prices.

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10 LBS. $9.50

20 Lbs..... $17.00
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Finest quality and the best colors in all new, flat, paper-masked Plexiglas. Sizes 6" x 12" and larger in the assortment. Dyes and cements available.

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Two 1955 Catalogs now available. "Leathercraft" or "Arts" and Crafts" — specify catalog desired. Write for NEW Indian Craft Bulletin.

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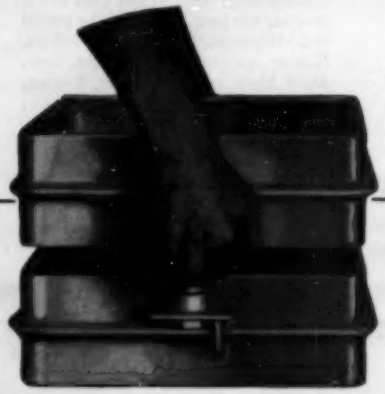

Sterling Style "E" Flask

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Sterling Steel Flasks combine maximum strength with minimum weight. They retain their rigidity and accuracy, year-in, year-out. Write for Sterling Catalog.

STERLING WHEELBARROW CO. Milwaukee 14, Wis., U.S.A.

ASSOCIATION NEWS

(Continued from page 8A)

College and received his master's degree in education from Wayne University.

He has served as Regional vice-president for the International Graphic Arts Education Association. He has also served as editor and membership chairman of the Michigan Industrial Education Society and also a member of the Certified Projects Committee.

Mr. Hill has written various articles for state and national publications and is well known in graphic arts circles.

He is a member of the National Education Association, Mu Sigma Pi Fraternity, Epsilon Pi Tau, and Phi Delta Kappa.

The Michigan Industrial Education Society is looking forward to a very active and prosperous year under Mr. Hill's leadership.

MICHIGAN STATE UNIVERSITY, EAST LANSING, MICH.

Michigan State University will hold its 7th Annual Industrial Engineering Conference, September 12–16, 1955.

As in the past, the week-long meeting will consist of daily general sessions and several subject discussion groups. The groups will be organized for the discussion of such topics as: Beginning Motion and Time Study; Advanced Motion and Time Study; Plant Layout and Materials Handling; Industrial Engineering for Small Plants; and Statistical Methods in Industrial Engineering.

Past conferences have been attended by over 800 people from over 200 companies. Many companies are sending men back year after year, to different discussion groups or just to pick up what's new in a field since last year.

For further details, write to *Professor James M. Apple, Mechanical Engineering Department, Michigan State University, East Lansing, Mich.*

THE 1956 MISSOURI SPRING CONFERENCE

The Missouri Annual Spring Conference on Industrial and Distributive Education will be held on April 20 and 21, 1956, on the University of Missouri campus, Columbia, Mo. — *Walter C. Brown.*

NATIONAL SAFETY CONGRESS

The 43rd National Safety Congress and Exposition, will be held Oct. 17–21, Chicago, Ill. Sessions on industrial safety scheduled for Conrad Hilton, Congress, Morrison, and La Salle hotels; traffic safety sessions at Congress hotel; commercial vehicle and transit safety sessions at La Salle hotel; farm and school sessions at Morrison hotel; and home safety sessions at Conrad Hilton hotel.

For further information write *R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.*

♦ R. K. Lane of the Public Service Company of Oklahoma, Dr. Chris H. Groneman of Texas A. & M. College, and Cecil Stanley, president of the American Vocational Association, will be the principal speakers at the October 21–22 Four-State Regional Industrial Arts and Vocational Education Conference, which will be held at the Kansas State Teachers College at Pittsburg, Kans. For this thirteenth annual meeting of the Conference, an exceptionally strong program of sectional meetings and exhibits has been arranged. — *J. V. Melton, Secretary.*

Personal News

H. P. HARSHBARGER RESIGNS

H. P. Harshbarger has resigned from the Greer Technical Institute, Chicago, Ill., to enter business. He had been in the field of education for 29 years.

As educational director of Greer Technical Institute, he occupied a prominent place in vocational education. He received his bachelor of science degree from Bradley, and completed his masters in education at Northwestern University. In addition to a successful career in vocational education in the public schools, Mr. Harshbarger also has had the benefit of industrial experience as administrator of the war production training program at Douglas Aircraft during World War II and executive duties with other equally prominent firms.

After the war Mr. Harshbarger was assistant chief of the educational and training division of the Veterans' Administration's branch office in St. Louis. Author of a textbook on drafting, Mr. Harshbarger also has served as president of the Illinois Industrial Education Association, chairman of the Metropolitan Vocational Board of the Chicago area, and has otherwise distinguished himself as a top vocational educator.

Recently, Mr. Harshbarger was appointed by the Illinois State Department of Registration and Education to serve a four-year term on the seven-man executive board under the new Illinois Vocational Schools Act — a law passed in July, 1951, by the State Legislature for the regulation and certification of all vocational schools in the state.

(Continued on page 54A)

B-G Electricity Teaching Aids for All Shop Departments

TEACH ELECTRICITY easily and inexpensively with the Crow Electric Kits, Complete Visual Experimental Equipment with Coordinated Text. Coupled with the B-G ET5 Test Bench (pictured here) the Crow Electric Kit 41-B will give you the background in experimental electricity for the Beginner that all students need. Crow kits cover the field from the Beginners' Set Kit No. 41B to the advanced Electrical Kit No. 50B. Check your Master B-G catalog, pages 183 to 185 for complete information and prices of these kits; page 73 for the B-G ET5 Test Bench and E 1 Electrical Bench. Have that wide awake electrical department that is teaching today's youths the story of Electricity.

THE ET5 TEST BENCH

answers the need of a test panel for Electrical Courses. It accommodates several students at once—checks appliances for voltage and shorts—checks motors and controls. Simple circuits can be traced and set up to note results. Provides low voltage instruction. Top size 30" x 7"—33¼" off floor. Panel size 28" x 54", wood shelf below. Modern welded steel legs painted green.

Write for price, wired ready to go.

ET5 TEST BENCH EQUIPMENT INCLUDES:

Flush Ammeter A.C. 0-5 Amps.
Flush Ammeter A.C. 0-25 Amps.
Flush Ammeter A.C. 0-50 Amps.
Flush Voltmeter A.C. 0-5 Volts
Flush Voltmeter A.C. 0-50 Volts
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4-8-12-16-20-24 Volt Secondary.
Switches, Receptacles, Fuse Box
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and Banana Plugs.

If you haven't a copy of the 1955 B-G Catalog write for it today

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Shop Equipment News

VERTICAL MILLING MACHINE

South Bend Lathe Works have produced a new vertical milling machine which has a table 9 in. wide and is available in 32 or 42-in. length with 20 or 30-in. longitudinal travel; 9½-in. cross feed and 18-in. vertical feed. Maximum distance spindle nose to table top is 20 in., spindle to column 20 in., rack and pinion ram adjustment 15 in. Three T slots for clamping work or fixtures extend full length of table. Movement of table is controlled by 1¼-in. 5-thread Acme lead screws, each equipped with large easy-reading micrometer dial.

(For Convenience Circle Index Code 0701)

NEW CINCINNATI ROYAL DRILLS

New 16-in. Royal Model LE drilling machines are announced by Cincinnati Lathe and Tool Company.

The new machines are especially suitable for production, toolroom, maintenance, school, and general purpose duty. Single spindle bench and floor models, and single and multiple spindle production bench models are available.

16-in. Royal Drill

Rated at ½-in. capacity in cast iron with an 1800 r.p.m. motor, the 16-in. Royals are equipped with a 0 to ½-in. capacity chuck mounted on a taper plug spindle. A No. 2 Morse taper spindle, less chuck, is optional if specified.

They are shipped complete with electrical controls including overload protection, motor mount, V belt, pulleys for spindle and motor, and contour-fitting felt guard as standard equipment.

Electrical controls are built-in and convenient. A simple V-belt drive transmits motor power efficiently and directly to the 6-splined spindle, for full torque at all spindle speeds.

They are shipped complete with electrical controls including overload protection, motor mount, V belt, pulleys for spindle and motor, and contour-fitting felt guard as standard equipment.

Electrical controls are built-in and convenient. A simple V-belt drive transmits motor power efficiently and directly to the 6-splined spindle, for full torque at all spindle speeds.

Five spindle speeds are provided ranging from 410 to 4840 with a 1800-r.p.m. motor; or 342 to 4033 with a 1500-r.p.m. motor.

Spindle speed changes are made easy by a unique tilting motor bracket which also maintains uniform belt tension.

They are available for immediate shipment from dealer or factory stock, and will also be on display at the Chicago Machine Tool Show, International Amphitheatre, September 6–17, in Booth 309.

(For Convenience Circle Index Code 0702)

NEW STEWART CLAY CO. CRAFTKILN

The Craftkiln, a brand new concept in enameling kiln design is now offered by Stewart Clay Co., Inc. Although it has a firing chamber of 6½ by 6½ by 2 in., it is exceptionally cheap. A bowl as large as 6 inches in diameter can be enameled with ease. A temperature is maintained throughout the firing without the need for controls.

Stewart Clay Company Craftkiln

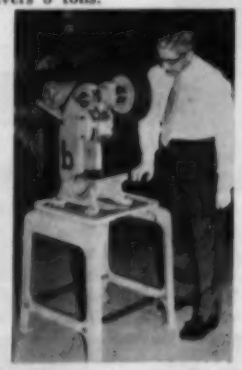
Made of heavy-gauge steel, nickel plated, its design and engineering are both pleasing and practical. The Craftkiln connects to 110-115 volt household current and costs no more to operate than an electric iron. A complete line of enameling supplies and equipment is also available from the same company.

Metal enameling is a satisfying and in many cases profitable craft for "Do-It-Yourself" enthusiasts because of the ease, economy, and speed with which gemlike designs can be applied to jewelry and other useful items. A Craftkiln accessory kit containing all tools and supplies for enameling also is available, as is also a kit for making porcelain jewelry which contains all items necessary for making and firing in the Craftkiln. A new catalog of all enameling supplies is available upon request.

(For Convenience Circle Index Code 0703)

BENCHMASTER NEW PUNCH PRESSES

Benchmaster Manufacturing Company, pioneer of small punch presses, announces a series of five new punch press models. By redesigning, two full tons are now delivered by the former 1-ton press. The widely recognized 4-ton Benchmasters now have a 5-ton capacity while the 7½-ton Benchmaster now delivers 8 tons.



The new Series 50 Benchmaster Press

These new Benchmaster presses are available in standard OBI inclinable types, as well as a deep throat model, back-geared models, and half-presses.

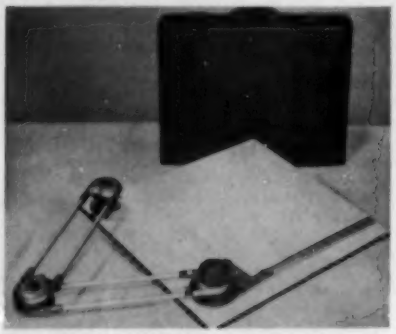
Latest improvements include a new oversize clutch design. The sliding key is now contained in a large steel collar taking the entire load off the crankshaft keyway. Brake size has been increased, with ram stopping on top dead-center after each stroke.

Included also is a redesigned ram with lock nut on the ball screw. New safety colors replace the gray finish formerly used.

(For Convenience Circle Index Code 0704)

NEW UNIVERSAL PERSONAL DRAFTING SYSTEM

Universal Drafting Machine Corporation, maker of drafting machines and scales, is now in production on a new drafting machine, known as the Universal Desk-Topper Drafting and Layout Machine.



Universal Desk-Topper Drafting and Layout Machine

It has a drawing capacity of 22 by 34 in., a 9-in., and a 15-in. engine-divided aluminum alloy scale, a folding board equipped with folding legs and rubber feet that, when opened, accommodates drawings up to 17 by 22 in., a box for instruments, a tracing paper dispenser, and a carrying carton or custom styled travel case.

This desk-topper is light, portable, and fits into a locker or standard office desk drawer. It takes but two minutes to get the desk-topper ready for action.

(For Convenience Circle Index Code 0705)

ALVIN'S POCKET SLIDE RULE

Alvin and Company recently announced a new 5-in. Pocket Slide Rule, specially designed for *on the spot* calculations.

Alvin's modern X-ACT Pocket Slide Rule has machine divided precision graduations which are deeply engraved with black and red scales that will never wear off. Fabricated of pure white Divinyl plastic dimensionally

Alvin's Pocket Slide Rule

stable, this pocket slide rule is resistant to acids, oils, etc. The complete 5-in. rule scales are K, A, B, C1, C, D, S, and T. The beveled leading edge incorporates both inches in 32nds and millimeter scales.

Each Alvin X-ACT Pocket Slide Rule is furnished with a strongly stitched genuine leather sheath and simplified instructions.

(For Convenience Circle Index Code 0706)

THE FREDERICK POST ROTOLITE

A new low-cost machine for the reproduction of drawings, called Rotolite, has recently been developed by the Frederick Post Com-

(Continued on page 52A)

Need Quick Delivery on School Shop Lumber?

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Wherever possible, we ship via commercial trucking lines for fast, dependable, safe, clean delivery.

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Of particular interest to instructors — in woodworking, general shop, plastics, crafts, electricity, and many other shop courses. Students can design and make the body of the lamp. We supply all other parts necessary—sockets, cords, plugs, shades, harps, switches, etc. Over 700 different parts shown in wholesale catalog. A MUST for all instructors occupied with highly educational and useful projects. Send 25¢ today for wholesale price list and parts catalog.

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• MANUALS • DRILLS
• TOOLS
• READY-TO-CARVE GIFT ITEMS

NEW ITEMS — offered for the first time in our Fall edition: Castolite Liquid Plastic; Screwdriver Handle Stock; Hotpack Electric Strip Heaters and Ovens, and others.

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- Guaranteed quality for best results
- Orders shipped same day received

Whether your leathercraft needs are for Beginners' Kits requiring no tools or experience (for young boys and girls) or fine tooling and carving leathers, accessories and tools (for older, more advanced students) it will pay you to check the new Larson Leathercraft Catalog FIRST. Dependable, guaranteed quality and careful, accurate grading help assure you of consistently excellent results, whatever your leathercraft program may be. Write NOW for your FREE catalog.

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Please send me a FREE copy of your latest Illustrated Catalog and Guide to Leathercraft.

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SHOP EQUIPMENT NEWS

(Continued from page 50A)

pany. The Rotolite reproduction machine has a number of desirable features that make it particularly well suited for classroom demonstration to illustrate print reproduction processes and thus familiarize students with the end purpose of engineering or architectural drawings.

The Rotolite exposes drawings by means of a rotating light source. It can be plugged into a standard current wall outlet anywhere. No plumbing or special wiring is required, just plug it in and the Rotolite is ready for operation.

Drawings placed on top of a sensitized reproduction paper are fed into the Rotolite and automatically exposed. Development of the print can be accomplished in a choice of dry or semidry diazo developing units.

The machine is available in three standard models accommodating prints up to 18, 27, or 42 inches in width, any length.

(For Convenience Circle Index Code 0707)

NEW MULTI-PURPOSE POWER MACHINE

Yates-American Machine Company have just introduced a new single-unit multi-purpose power woodworking machine which will be found very helpful in school shops and home workshops.

The Y-A Multi-Purpose Machine

This machine is a combination of circular saw, jointer, and disk sander, all mounted on a tabletop cabinet.

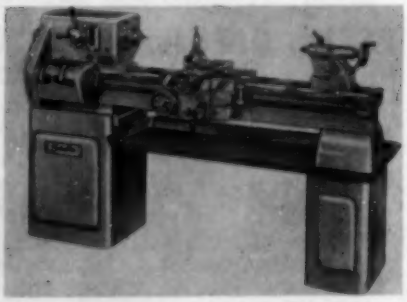
To change from the saw to the jointer or sander, it is necessary only to turn a wheel. The conversion is then complete. No tools need be used, nor belts shifted.

Accessories also are obtainable which can be quickly and easily attached to permit the machine to be used for wire brushing, polishing, drum sanding, buffing, rotary filing, routing, or drilling.

(For Convenience Circle Index Code 0708)

15-IN. SEBASTIAN GEARED HEAD LATHE

The new 15-in. Sebastian Geared Head Lathe, designed and built by Sheldon Machine Co., Inc., is designed to permit easy, cost saving operation. All controls are centrally grouped within instant reach of the operator.



New 15-in. Sebastian Geared Lathe

Each lathe is rigidly checked for accuracy and individually inspected for 19 different accuracy tests. These individual test sheets are sent with each lathe when shipped from the factory as a guarantee of its precision.

The cabinet in the pedestal leg is for convenient storage of tools and accessories.

(For Convenience Circle Index Code 0709)

WOODWORKING TOOLS

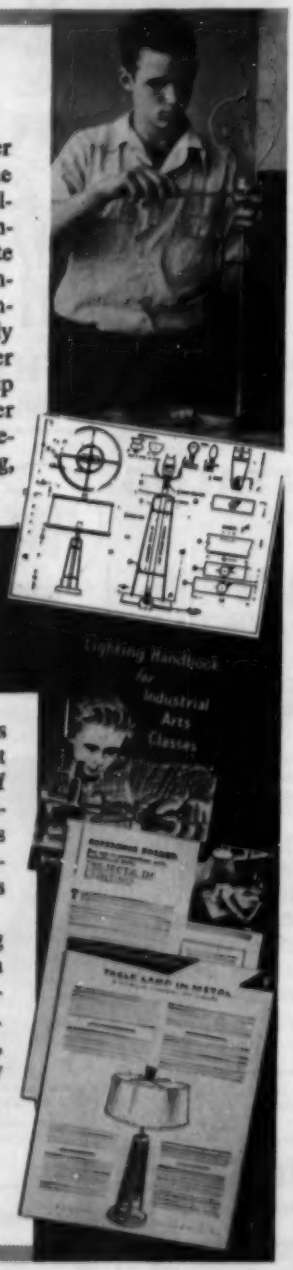
What is termed the most complete illustrated folder of imported woodworking tools has just been issued by Frank Mittermeier.

This new 1955 folder shows many fine imported tools and accessories. These tools are manufactured in West Germany by the world famous Strausmann and Co. for over 100 years. They are fashioned by experienced craftsmen of fine steel to hold a sharp keen edge. The Mittermeier firm established in 1936, specializes in tools for the wood carvers, sculptors, art schools, school shops, and institutes.

(For Convenience Circle Index Code 0710)

A brand new program of teaching aids!

In almost every shop, lamps and other lighting projects are constructed during the year. And yet, up till now, students have seldom had available information on the principles of good lighting and how to incorporate these principles into an attractive and worthwhile project. Recognizing that lighting cannot be introduced as an area in the already crowded I.A. curriculum, Better Light Better Sight Bureau has produced a flexible group of supplementary study aids to provide teacher and student with project and reference materials which can be fit into woodworking, metalworking, ceramics and other areas.



Working with Light

Drawing on the principles and suggestions in the N.E.A. manual, "Teaching about Light and Sight," as well as on the guidance of classroom teachers, administrators and educators prominent in the field, the Bureau has produced a program which offers new opportunities for making shop work and projects more meaningful.

Materials include a 100-page "Lighting Handbook," for use by the teacher and as a reference book in the planning area; 12 project leaflets; and a student reference folder.

For more information about this program, consult your local electric service company or write for free descriptive folder to

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PERSONAL NEWS

(Continued from page 49A)

HAROLD O. AKESON DIES

Harold O. Akeson, a member of the faculty for almost 36 years at East Orange High School, East Orange, N. J., passed away on April 20, 1955.

Harold O. Akeson

Mr. Akeson started to teach at East Orange High School upon his graduation from Fitchburg State College in Massachusetts. He taught mechanical drawing and related shop subjects during the years since that time. He received his bachelor of science degree from New York University in 1937.

In addition to his regular work, he did both etching and designing. He had also undertaken the compiling of a volume describing useful articles to be built in the home workshop.

He prepared many articles for publication in professional magazines, and was the author of a book entitled *Wood and Art Metal*.

Mr. Akeson will be long remembered by his many friends and associates, both faculty and students, who knew him. He is survived by his wife, Mrs. Rachel Akeson.

♦ Rex Smelser, director of the Sowela Vocational-Technical School, Lake Charles, La., was a member of the Department of Industrial Education staff at Northwestern State College, Natchitoches, La., during the summer term 1955. He taught a course in methods and techniques of conference leading and assisted with a special problems course.

♦ C. W. Haddox, industrial-arts teacher at the Bastrop, La., High School, served as a graduate assistant in the Department of Industrial Education at Northwestern State College of Louisiana during the summer session 1955. He taught a course in general metals.

♦ Dr. Ralph G. Iverson has been named first lieutenant governor for Wisconsin District 35 of Toastmasters International. He is the director of student personnel services at Stout State College. Dr. Iverson was elected at the Toastmasters District 35 spring conference and speech contest.

At the conference, attended by over 200 Toastmaster delegates from throughout Wisconsin, Dr. Iverson, as educational chairman, presided over the educational session of the meeting.

Having served the Toastmasters last year as educational chairman and now as first lieutenant governor, Dr. Iverson is in succession for the office as governor of District 35, beginning next year.

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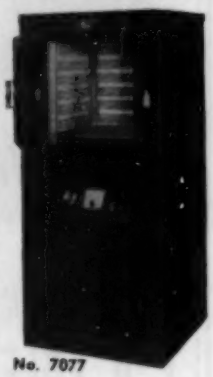

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News Notes

♦ Twenty-five leading educators, most of them industrial arts and vocational education teachers and supervisors, were appointed to the Industrial Arts Award Advisory Council in January, 1955, by Henry Ford II, president of Ford Motor Company.

Included among the group were three territorial representatives, Don M. Dafoe, commissioner of education, Alaska; Albert J. Feirer, director, trade and industrial education, Hawaii; and Ferdinand Rossy, general supervisor, Industrial Arts Education, Puerto Rico.

Each of the men, with the exception of J. Elmer Zearfoss, District of Columbia, who was appointed to a one-year term, were named to three-year terms on the Council.

The new councilors are Rex Sullivan, University, Ala.; O. H. Chidester, Tucson, Ariz.; Kenneth F. Perry, Greeley, Colo.; Ray M. Karnes, Urbana, Ill.; Lewis Yoho, South Bend, Ind.; Thomas A. Hippaka, Ames, Iowa; Walter J. Robinson, Natchitoches, La.; Maurice C. Farney, Augusta, Me.; Stanley J. Pawelek, Baltimore, Md.; W. L. Newton, Meridian, Miss.; Merton Wheeler, Jefferson City, Mo.; O. K. Moe, Dillon, Mont.; Howard Gorham, Lincoln, Neb.; John J. Smith, Trenton, N. J.; Marvin F. Poyzer, Grand Forks, N. Dak.; Edward J. Medeiros, Providence, R. I.; H. P. Gerber, Aberdeen, S. Dak.; Henry Doll, Rutland, Vt.; Reinholt B. Haring, Wenatchee, Wash.; and Verne C. Fryklund, Menomonie, Wis.

♦ "A Pocket Book of Speech Formulas"—a new training aid for foremen and other supervisors—has been published by the National Safety Council.

Written by Lester Lyle McCreary, professor of speech and English at California Institute of Technology, the 36-page manual presents ideas that will assist anyone called upon to give a safety talk—or any talk. It shows how to practice a speech, how to use the best voice, how to hold audience interest and how to make the speech teach.

The "Pocket Book of Speech Formulas" is illustrated with line drawings and is covered with a heavy paper cover printed in two colors. Cost to council members 60 cents each, and $1.20 to nonmembers.

♦ Just off the press and ready for distribution by Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif., is the 1955 Supplement to Bailey's Complete 1954 Sale and Rental Catalog.

The Supplement contains listings of over 120 titles released through Bailey Films during the past several months. Films are categorized under art, driver training, languages, arithmetic, physical education and recreation, primary films for language arts and science, science and nature, social studies, and teacher training. Described along with other subjects are films distributed nationally on an exclusive basis by Bailey Films, Inc.

♦ Association Films, Inc., 34 Madison Ave., New York 17, N. Y., has issued a special booklet of newly-released industry sponsored films, "Free Film Bulletin," available to schools, colleges, clubs, and other community groups.

Among those listed are: "New Horizons in Aluminum Brazing," and "Welding Advances with Aluminum."

Copies of the bulletin may be had by writing to Association Films.

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4 Fundamentals of Carpentry II	4.50	1.25
5 Fundamentals of Electricity	3.50	1.25
6 Graphic Arts Procedures	3.75	1.50
7 Machine Shop Operations and Setups	5.50	1.40
8 Sheet Metal Shop Practice	4.00	1.10
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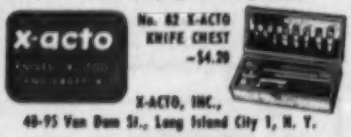

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New Publications

Automotive Chassis and Body

By William H. Crouse. Cloth, 609 pp., 6¼ by 9¼ in., illus., $5.50. McGraw-Hill Book Co., Inc., New York City.

A comprehensive, up-to-date book on the subject. It covers the fundamental principles and enumerates the automotive chassis fundamentals. Then the automotive springs and suspension are explained, as well as shock absorbers, steering systems and steering and suspension troubles.

Next servicing steering linkage and front and rear suspension is discussed, also front-end alignment, manual steering-gear service, Saginaw power-steering service, Gemmer Hydraguide power steering service, linkage-type power steering service, coaxial power-steering service, automotive brakes, brake and power brake service, tires and tire service, chassis lubrication, car frame and body, air conditioning, and servicing air conditioners.

Electro-Technology

By M. G. Say. Cloth, 167 pp., 5¾ by 8¾ in., illus. Philosophical Library, Inc., New York City.

A book which aims to help students and practicing electricians to learn how to solve circuit problems found in light and heavy electrical engineering.

Mathematics and Measurements

By Merrill Rassweiler and J. Merle Harris. Cloth, 351 pp., 6¼ by 9¼ in., illus. Row, Peterson and Co., Evanston, Ill., and White Plains, N. Y.

With the increased need for technically prepared employees, there also is a necessity of having men who know mathematics for working with measurements in shops and laboratories.

This book was designed to help those who need this type of knowledge in the measurement field, to acquire the mathematical skills that they are lacking.

The book contains many problems, all based on formulas gathered from numerous sources. It is divided into nine chapters which deal with numbers, quantities, and measurements; calculations with measurements: the slide rule; formulas; equations, quadratic equations; derivations; problem solving; and graphs.

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General Shop Bench Woodworking

By Verne C. Fryklund and Armand J. LaBerge. Paper, 152 pp., 7¼ by 10¼ in., illus., $3. McKnight & McKnight, Bloomington, Ill.

This is the twenty-first printing of the second edition. It contains 76 units which

(Continued on page 58A)

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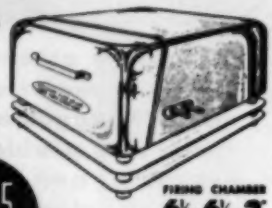

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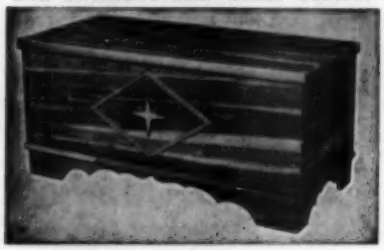

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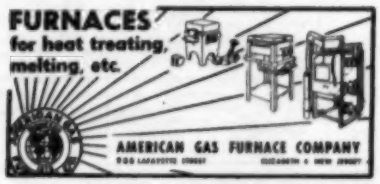

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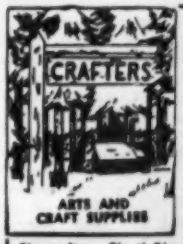

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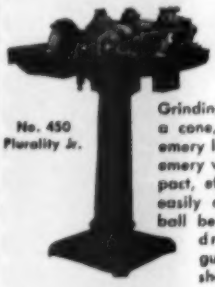

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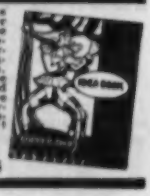

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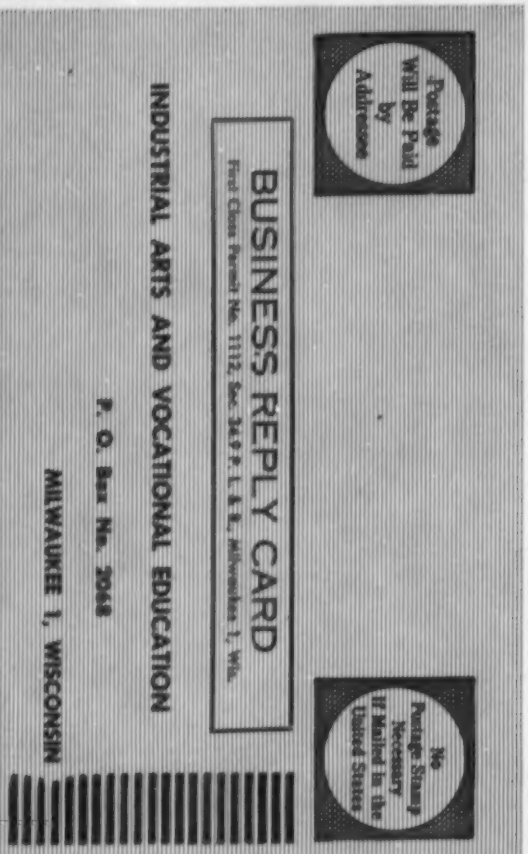
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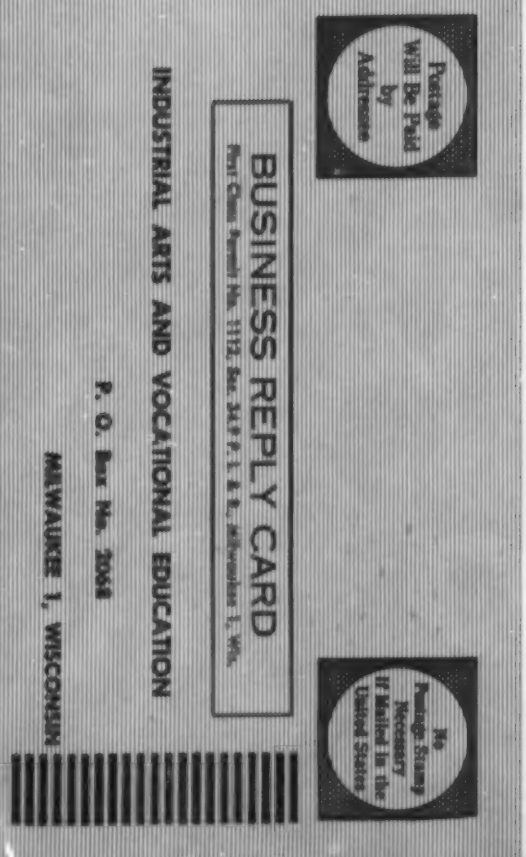
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